APPENDIX B
COLUMBIA AND WILLAMETTE RIVER SEDIMENT QUALITY EVALUATION

Appendix B

Columbia and Willamette River Sediment Quality Evaluation for the Columbia River Channel Deepening Feasibility Report

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Columbia and Willamette River Sediment Quality Evaluation for the Columbia River Channel Deepening Feasibility Report

1.0 Introduction

The purpose of this report is to characterize the sediment of the Columbia and Willamette Rivers based on the sampling event described. Frequent reference will be made to the project "Sampling and Analysis Plan (SAP) for the Columbia River Channel Deepening" (Exhibit A) attached to this report and listed as a reference. The project description, site history and assessment are detailed in section 1 of the SAP. Previous sampling, also referred to in that section of the SAP, indicates that the bulk of the material evaluated, from the present 40-foot deep channel, has been found to be suitable for unconfined aquatic disposal, some material in the Willamette River would require further evaluation. Much of the material proposed to be dredged from the Willamette River channel-deepening project has not been evaluated previously.

The sampling and analysis objectives listed below are those stated in the (SAP) (sec. 2.0). This report will outline the procedures used to accomplish these goals.

SAMPLING AND ANALYSIS OBJECTIVES

The sediment characterization program objectives and constraints are summarized below:

- To characterize sediments to confirm or establish area rankings in accordance with the regional dredge material testing manual, the Dredge Material Evaluation Framework for the Lower Columbia River Management Area, November 1998 (DMEF).

- To provide information needed to develop a baseline cost estimate relative to proper disposal of dredged material.

- To provide information for the Columbia River Channel Deepening (CRCD) Environmental Impact Statement (EIS) sufficient to describe the material to be potentially dredged.

- Only physical and chemical characterization will be conducted. It is anticipated that additional chemical and biological testing shall be required prior to dredging commensurate with the proposed disposal method and DMEF.

In June of 1997 eighty-nine stations were sampled from the Columbia River channel, river mile (RM) 6.00 to RM 106.20, for physical analysis, of which, 23 were further analyzed for chemical contaminants. Sixty-eight samples were analyzed from 43 stations in the Willamette River, RM 0.10 to RM 11.55, for physical analysis, 45 (including replicate samples) were selected for chemical analysis. The following chemical tests were run on selected samples (see Tables 4-15); 9 inorganic total metals, polynuclear aromatic hydrocarbons (PAHs), total organic carbon (TOC), acid volatile sulfide (AVS), pesticides/polychlorobiphenyls (PCBs), Pore Water Tributyltin (TBT) and P450 Reporter Gene System (RGS), a dioxin/furan screen.

On September 14, 1998 surface grab samples were collected from 12 deep-water locations on the Willamette River. The purpose for collecting and analyzing these areas was to characterize the surface sediment at potential deep-water disposal sites in the Willamette River. Chemical analyses included metals (10), pore-water TBT, pesticides/PCBs, PAHs, phenols, phthalates, and miscellaneous extractables. Information is provided in tables 16-20, plates 26-27, and Exhibit B.

Exhibit B contains "Sediment Characterization Study of Local Sponsors' Berths; Columbia River and Willamette River Navigation Channel Deepening; Longview and Kalama, Washington and Portland, Oregon," Volume I, dated February 1, 1999. The purpose of the report was to provide preliminary dredge prism characterization of sponsor port facilities.

Purposed channel deepening from 40-feet to 43-feet would require disposal of the dredged material. In-water disposal of dredge material falls under the jurisdiction, of either, the Clean Water Act (CWA) or the Marine Protection, Research and Sanctuaries Act (MPRSA). An overlap of jurisdiction exists within the territorial sea (ref. DMEF page 20). This sampling event is not meant to be the final characterization of the sediment in the channel. Future characterization of the sediment may be required prior to any dredging. This report will characterize the sediment based on the current sampling event, but is not meant to make a final determination for future dredging disposal. In particular, areas with fine-grained sediments and areas that show contaminates above screening levels (SL), will be subject to further sampling and analysis. All sampling and analysis presently completed is (as future work will be) consistent with the laws regulations and guidance controlling this activity (for complete regulation overview see DMEF chapter 2).

2.0 Framework

The framework or basis of sediment sampling and analysis is consistent with an established national framework for the evaluation of environmental effects of dredged material disposal. This comprehensive evaluation framework, DMEF, governs sampling, sediment testing and test interpretation (disposal guidelines) for determining the suitability of dredged material. This ensures adequate regulatory controls and public accountability for disposal of sediment. The framework has been developed pursuant to the Clean Water Act of 1977 (Public Law 92-500), as amended, to the Marine Protection, Research and Sanctuaries Act of 1972 (Public Law 92-532), as amended, and to the national level dredging and disposal guidance developed subsequent to the passage of the laws (40 CFR 230-233; 40 CFR 220-229). Applicable national guidance documents include the jointly prepared Environmental Protection Agency/Corps of Engineers national framework entitled *Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual*, dated February 1991 (referred to as the Ocean Testing Manual and also known as the "Green Book"), and the inland testing manual, entitled *Evaluation of Dredged Material Proposed for Discharge in Waters of the US – Testing Manual,* dated February 1998 (referred to as the "Inland Testing Manual").

The recent development of a regional DMEF has been the result of a cooperative interagency/intergovernmental program. It was established by the US Army Corps of Engineers (Corps), Region 10, US Environmental Protection Agency (EPA); Washington Department of Ecology (DOE), Washington Department of Natural Resources (DNR), and Oregon Department of Environmental Quality (DEQ) as principal agencies. These five agencies have regulatory and proprietary responsibilities for dredged material evaluation and disposal in the region. This group has developed a regional manual attempting to identify the most reliable, recognized, and cost effective sampling and analysis procedures for appropriately characterizing dredge material, and to incorporate these procedures into a document for application to the region. Chemical and biological tests and interpretation guidelines were developed for assessing the acceptability of dredged material for unconfined aquatic disposal. Application of these tests and guidelines will also provide preliminary information on the need for other disposal or management options, such as confined aquatic, nearshore, or upland disposal.

This regional framework document distills the accumulated knowledge and experience with dredged material management in the Pacific Northwest over the last 25 years. This document describes stepwise procedures for dredged material assessment and is intended for use by the regulatory community in the Lower Columbia River Management Area. Full consideration was made of all pertinent State and Federal laws, regulations, and guidance, including other regional dredged material management programs. The regional framework is consistent with the guidelines of the two national level manuals.

The procedures used in development of the manual were derived from, and inspired by, similar regional programs, including the successful Puget Sound Dredged Disposal Analysis (PSDDA) program for the Puget Sound region of the State of Washington, the Grays Harbor/Willapa Bay Dredged Material Evaluation Procedures Manual, and Portland District Corps of Engineers dredged material tiered testing procedures.

The goal of the manual is to provide the basis for publicly acceptable guidelines governing environmentally safe unconfined aquatic disposal of dredged material, thereby improving consistency and predictability in dredged material management. The establishment of evaluation procedures is necessary to ensure continued operation and maintenance of navigation facilities in the region, to minimize delays in scheduled maintenance dredging, and to reduce uncertainties in regulatory activities.

The tiered evaluation process outlined in the DMEF provides for physical and chemical evaluation in Tier II. The Tier III allows for bioassays both acute and chronic toxicity as well as bioaccumulative effects.

3.0 Previous Studies

As part of the Lower Columbia River Bi-State Program (referenced) sediment sampling and analysis was conducted, in 1991 and 1993, by Tetra Tech. A review of the sediment chemistry data from the Bi-State Reconnaissance survey relative to the federal Navigation Channel was made. No chemicals of concern above screening levels, established to evaluate the suitability of sediments for open water disposal, were detected in any sediment samples taken from the Federal Navigation Channel during the Bi-State survey. Only metals, no PAHs, PCBs, or pesticides, were detected in any sample collected from the channel. PAHs were found outside the channel in only 5 of 54 stations sampled and only one PCB, Aroclor 1254, was detected at one station. The Bi-State study did not conduct analyses for dioxin/furan in any sediment from the Federal Navigation Channel but limited their analyses to a select set of fine grained material samples. The Bi-State does not provide any evidence for dioxin/furan contamination of project sediments. The Corps as part of the November 1990 Columbia River Channel Deepening Reconnaissance Study (USACE, 1990) did collect sediment samples for dioxin/furan analyses from within the proposed channel alignment. Sample locations were chosen near discharges from pulp and paper mills in the Columbia River and select areas of the Willamette River. It was concluded that significant dioxin/furan contamination of the sediments within the Lower Columbia River portion of the project was not evident while further studies were recommended for the Willamette River.

The balance of evidence from previous sediment studies (1988, 1989, 1992 & 1996) of the lower Willamette River navigational channel shoals suggests that sampled shoals near the edges of the river contain more contaminates than those taken from the main channel areas. Most sediment sampled in these studies, with few exceptions, was found to be acceptable for unconfined open water disposal. The 1997-1998 "Joint DEQ/EPA Willamette River Investigation" confirm that nearshore areas, outside the navigational channel, contain much higher levels of contaminates than areas sampled within the proposed deepened navigational channel.

4.0 Ranking

Historical-sampling data from the Columbia and Willamette Rivers was used to rank the CRCD project area in accordance with the DMEF guidelines. The SAP (sec 3.1, Table 1&2) shows the present project area rankings and ranking description guidelines.

The historical data shows that the main stem of the Columbia River from river mile (RM) 5 to RM 74 and RM 88 to RM 99 have been given the "exclusionary" ranking. Exclusionary rank is coarse grain material (greater than 80% retained on a No. 230 sieve) with Total Volatile Solids (TVS) less than 5% and sufficiently removed from sources of sediment contamination. River mile RM 74 to RM 88 and 99 to 106 on the Columbia River was formerly ranked "low" in the draft DMEF has subsequently been ranked "exclusionary" in the final DMEF. This new ranking is based on data made available from this study. All the mainstem Columbia River navigational channel has been ranked "exclusive" based on data from this study.

Based on historical data the Willamette River has been ranked using the same DMEF criteria as the Columbia River. RM 0 to 3 and the O&M shoal at RM 8 to 10 are ranked "low" (see above explanation for, "low"). RM 3 to 10 were ranked "low-moderate" which means available data indicates a "low" rank, but there is insufficient data to confirm the ranking. The RM from 10 to 11.1 has been ranked "moderate" indicating that available data indicate chemical concentrations within a range associated historically with potential for causing adverse biological impacts. It could also receive this rank because sources exist in the vicinity of the project, or there are present or historical uses of the project site, with the potential for producing chemical concentrations within a range associated with some potential for causing adverse biological impacts. There are specific sites on the Willamette that have qualified for the "high" ranking. This means that known chemical sources, high concentrations of chemicals of concern, or significant responses in at least one of the last two cycles of biological tests. (When a "high" rank is indicated for an area based on preliminary data, the "high" rank is assigned to the area as a protective measure. That is, there is no rank of "high-moderate").

5.0 Sampling Event

Personnel from the US Army Corps of Engineers, Portland District (USACE) and National Marine Fisheries Service (NMFS) conducted the sampling event on the Columbia River, from June 2-5,1997, using their research vessel "Nerka". A Van Veen box core sampler was used to collect samples, from the surface up to 10" deep, from the Columbia River sediment. The samples were designated CR-BC-## (sequentially numbered).

The proposed sampling locations for the Columbia River Channel Deepening (CRCD) are contained in Appendix B of the SAP and listed in Table 1, of this report. The proposed location information was digitized from USACE, Portland District navigational charts and transferred into a Geographic Information System (GIS) database. The GIS database was converted to an ASCI format and the field was issued an electronic file and a hard copy of the location data. Due to program errors and incompatibility with the ships Global Positioning System (GPS) the electronic aid for sample site location was not used. As a result, there is some variation between the proposed sites and the actual sites. The Captain, using USACE, Portland District navigational charts with the proposed sampling sites marked and the calculated coordinates, navigated the actual sampling sites. Due to the program error, mentioned above, some of the calculated coordinates were in obvious error and did not match selected sites, marked on the charts. In these cases the Captain visually navigated to the chart location and then recorded the coordinates, from the onboard GPS, into the ship's log and marked the site on the navigational charts to verify actual locations. This accounts for variations between proposed and actual sampling locations. Actual sample locations are provided in this report, coordinates (Table 2) and site maps (Plates 1-27). Station locations on the Columbia River were chosen from shoal areas as indicated on the most recent Channel condition surveys performed by the USACE, Portland District Hydrographic Survey Branch (Table 3).

Station locations on the Willamette River were selected by Tom Rosetta of the Department of Environmental Quality (DEQ), Rick Vinning of Department of Ecology (DOE), and John Malek of the Environmental Protection Agency (EPA), Region 10 based upon shoals identified in the 1994 channel condition survey and proposed channel alignment. Sample locations are provided in this report, coordinates (Table 4) and site maps (Figure 2).

The Willamette River samples collected, July 22-25,1997, by Hart Crowser Inc., from Seattle Washington, were taken using two different sampling devices. The samples, surface to 10" deep, were taken with a Van Veen box corer and numbered sequentially using WR-BC-##

convention for shoals less than 3 feet thick. A 4" vibra core sampler was used for collecting the "GC" and the "CD" designated samples. When length permitted, the core was divided into 6' sections, the suffix designation of "A" for the surface to 6' segment, "B" for the 6' to 12' segment, etc. The "Z" sample represents the segment below the dredging prism. The "Z" samples, which would represent the new surface material (NSM), were submitted for physical analyses only.

Hart Crowser Inc. personnel supplied the following information on positioning for the Willamette River sampling event. GPS navigation was used for positioning the sampling equipment during the project. The system used was a Trimble Model 4000 DS GPS receiver. The GPS antenna was located on the sampling vessel on the A-frame above the pick point of the sampling device. A Trimble ProBeacon Coast Guard beacon receiver was used to provide differential corrections to the GPS. The accuracy of the ProBeacon corrections was better than +1 meter based upon on-site calibrations at the US Moorings dock on the Willamette River. The GPS receiver, set up on the survey vessel sent differentially corrected geographic positioning data to an integrated navigation software package called HYPACK. The software was installed on an 80486 DX33 PC with a 245-Mb hard drive. The GPS receiver displayed and transmitted data to an on-board computer in North American Datum 1983 geographic coordinates (latitude/longitude). HYPACK converted the North American Datum 83 (NAD 83) geographic coordinates to NAD 83 Oregon State plane coordinates – north zone. HYPACK, acting as a data manager, displayed the vessel's position relative to a proposed sampling location in plane view on a video screen. The resultant pictorial screen presentation, as well as numeric navigation data, assisted the vessel operator in approaching and maintaining the proposed sampling location while sampling. Once the sampling device impacted the bottom the actual sampled position was recorded in a file on the computer by hitting an event mark."

6.0 Current Study

6.1 Columbia River Data

As mentioned earlier in this study, eighty-nine stations (no sample was recovered after 4 tries at #45) were sampled from the Columbia River Channel, river mile (RM) 6.00 to RM 106.20, 90 samples were submitted for physical analysis, of which, 23 were further analyzed for chemical contaminants. This data is presented below:

<u>Physical, Total Organic Carbon (TOC) & Total Volatile Solids (TVS) Analysis:</u> Results for physical, TOC and TVS analysis are presented in Table 5. As expected, 95% of the material recovered was classified as poorly graded sand with a mean grain size of 0.56 mm and an average TVS of 0.62%. Of the 90 samples submitted for physical analysis only 4 (#s 07,57,75A, 76) exceeded 20% fines and had greater than 5% TVS. These samples, excluding #75A, were submitted along with 20 other samples for chemical analysis. Sample #75A represents a portion of sample CR-BC-75. (For more information on sample #75A see section 7.0 "Discussion").

Metals: Results for metals are presented in Table 6. Twenty-three sediment samples were analyzed for 9 metals, As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, and Zn. Of the 23 samples submitted 3 samples (#s 07,57,76) showed the highest levels of metals, but none of the levels approached the screening level (SL).

Pesticides and PCBs: Results for Pesticides and PCBs are presented in Table 7. Pesticides were found in 4 of 23 samples (#s 07,57,74,76) tested. The laboratory flagged all of these values with a "J" notation, which indicates the values are considered estimate concentrations. They are considered estimates because the value is less than the method reporting limit (MRL), but greater than the method detection limit (MDL). PCBs were found in sample #76 only. None of the pesticides or PCB levels that were found in samples exceeded the SL for total PCBs.

Polynuclear Aromatic Hydrocarbons (PAHs): Results for PAHs are presented in Table 8&9. Low levels of PAHs were found in most of the 23 samples submitted for chemical analysis. Three samples (#s 07,57,76) showed the largest individual amounts of both high and low density PAHs detected. All levels detected as well as totals, of low and high density PAHs were well below the SLs.

P450 Reporter Gene Assay, (Dioxin/Furan Screen). Results for P450 RGA are presented in (Table 10): P450 is the designation for a group of enzymes that play a key role in activating or deactivating many toxic chemicals including PAHs, PCBs, dioxins and furans. Sample CR-BC-76 is the only sample, taken from the Columbia River, that is a candidate to contain dioxins/furans. If the area associated with CR-BC-76 were to be dredged in the future, it would warrant further testing for dioxin/furans. (Dioxin/furan contaminates were found in a select set of fine grained material sampled outside of the navigational channel, see 1991 & 1993 Bi-State Reconnaissance survey.)

6.2 Willamette River Data

1997 m.k.

As mentioned earlier, for this study, sixty-eight sediment samples (includes replicates and multiple samples from some cores) were collected in June ~~1999~~ from 43 sites on the Willamette River, from RM 0.10 to RM 11.55. This data is presented below:

Physical, Total Organic Carbon (TOC) & Total Volatile Solids (TVS) Analyses: Results for physical, TOC and TVS analyses are presented in Table 11. Of the 68 samples analyzed for grain size, 43 (63%) exceeded 20% fines and/or 5% volatile solids. The distribution of fines varied within the sampled area, both up and down the river as well as from the surface to the depth of the cores sampled.

Metals: Results for metals analyses are presented in Table 12. Fifty-two sediment samples were analyzed for 9 inorganic metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Ag, & Zn) and for organotin (TBT)(pore water). Of the 52 samples analyzed only the following exceeded SLs for metals, #42C for mercury and #42D for lead. Tributyltin exceeded the SL in samples #23 and #21.

Pesticides and PCBs: Results for pesticides and PCBs analyses are presented in Table 13. Of the 52 samples submitted, the SL was exceeded for DDT in nine samples (#s 4A, 4B, 21, 24A, 25A, 29, WR-C, 35A, 40A). Only one other pesticide, Dieldrin, exceeded the SL, sample (#40A). PCBs exceeded SL in only one sample, #42C.

Polynuclear Aromatic Hydrocarbons (PAHs): Results for PAHs are presented in Table 14 & 15. Sample #s 20 and 22 exceeded almost all of the SLs and totals for both low and high PAHs. Sample #21, 11A & 15 exceeded SL for 2 PAHs. Sample # 16 exceeded one SL for PAHs. Sample #s 11 through 22 are from RM 2.90 to RM 6.20. The heaviest concentration of these contaminates are from RM 5.15 to RM 6.20.

P450 Reporter Gene Assay, (Dioxin/Furan Screen): Results for P450 RGA are presented in Table 16. P450 is the designation for a group of enzymes that play a key role in activating or deactivating many toxic chemicals including PAHs, PCBs, dioxins and furans. Samples WR-GC-18A, 22, 24A, 30A, 32A, 33A, 38A are all candidates to contain dioxins/furans and therefore require specific attention. Four of the samples (18A, 24A, 30A, & 33A) contain similar amounts of PCBs; this accounts for the chlorinated hydrocarbons detected in the P450 RGA. Three samples (22, 32A, 38A) contain possible low levels of dioxin/furans. Sample WR-BC-22 contains possible higher levels of dioxin/furan. If the area represented by these samples were to be dredged, it would warrant further testing for dioxin/furans.

In September 1999 additional surface sediment samples were collected from 12 deep-water sites in the Willamette River (see Exhibit B, table 4, for station coordinates and water depths). All samples were collected below the proposed 43-foot (plus 2-foot overdepth) deepening project and ranged from –48 feet to –79 feet below the Columbia River Datum (CRD). Various stations exceeded the screening levels and maximum levels of the DMEF for several organic contaminate (see tables 18 –21). No sample exceeded SL's for metals or TBT (see table 17). As with the CRCD shoal samples and the EPA-DEQ 1997-1998 Sediment Quality Study, the middle reach of the river (RM 4.0to 8.0) is the most contaminated. High levels of PAHs were found at RM 6.1 (Grab-05).

7.0 Discussion

7.1 Samples of Interest – Columbia River

Sampling on the Columbia River was done using a Van Veen grab sampler. This type of sampler was selected because the nature of the material sampled is primarily a coarse grained sand with few volatile solids, which does not core well. Because of the types of shoaling and constant reworking of the material proposed to be dredged it is homogenous in nature. A surface grab sample, therefore, is representative of the shoal to be dredged. This study confirms and supports the "Exclusionary" ranking given to the majority of the mainstem of the Columbia River Federal Navigation Channel.

Sample station CR-BC-75 was the deepest station of a series of three sampling stations at RM 99+20. These stations are located just downstream of the mouth of the Willamette River and the Morgan Bar disposal area, which receives fine-grained material, dredged from the

Willamette River. For the reasons stated, these stations were selected for physical and chemical analyses as part of the CRCD Feasibility study sampling and analysis plan (see attached). After collecting a sample at station CR-BC-75 for chemical analysis, a 3-4" layer of "clay" was noted below the top of the sampler. As this sample had been touched and therefore could not meet sampling protocols for chemical analyses, only a sample for physical analyses was collected. This sample was labeled CR-BC-75A. The NMFS's boat had moved off the station to the next sample location, CR-BC-76, so station CR-BC-75 was not resampled. At the time of sampling at station CR-BC-75 the water depth was recorded to be 71 feet. Correcting for river stage, depth of the sounding transducer, and Columbia River Datum (CRD) the water depth below CRD would be approximately 59.5 feet at this location. This is 14.5 feet below present dredging depths and 11.5 feet below a proposed 48-foot channel (43ft + 5 ft advance O&M). The fine-grained material represented by CR-BC-75A is well below any existing or proposed dredging prism.

Station CR-BC-76 This sample was not scheduled to be chemically analyzed, but when the field personnel saw that it was fine-grained material, a chemical sample was added. Sample CR-BC-76 contained the highest levels of most chemicals of concern, but these levels were still well below SLs.

Station CR-BC-45 No sample was submitted for analysis from this station. After 4 unsuccessful attempts to recover sediment without success, no further attempts were made to sample this station.

Station CR-BC-07 & 57 These two sample were of interest only because they contained higher levels of contaminates (along with # 76) than other samples taken from the Columbia River, in this study. While they contained the highest levels of contaminates in the Columbia River, they are still considered low levels, well below the Tier II SLs. Sample CR-BC-07 represents material from the turning basin in Astoria. Sample CR-BC-57 is outside the Columbia River Federal Navigation Channel in shallow water not in an area proposed to be dredged.

7.2 Samples of Interest - Willamette River

Willamette River Channel sediments are fined grained and more heterogeneous in nature than the Columbia River Channel sediments. A 4" vibra core sampler was used for collecting samples to various depths; samples designated "GC" and the "CD". The samples, surface to 10" deep, were taken with a Van Veen box corer and numbered sequentially using WR-BC-## convention.

Station WR-GC-22 This sample was taken at river mile 6.2 on the Willamette River. It had a physical composition of only 4.4 % finer than sand with volatile solids of 2.3 %. The content of total low density PAHs was 395,500 ppb, which is 76 times the current SL and 13.6 times the maximum level (ML) the bioaccumulation trigger. The content of total high density PAHs was 1,024,100 ppb, which is 85 times the current SL and 14.8 times the ML. A possible explanation for this coarse grained material holding this unusually high level of contamination could be that this material is "native" sediment which has not moved since being contaminated, either by dredging or natural scouring by river currents.

Station WR-GC-24 Sample 24 was taken at river mile 6.7 on the Willamette River. This 7.1-foot long core sample was divided into 3 composite samples. The surface to 5.5-foot depth was labeled "A", the section from 5.5 feet to 6.4 feet labeled "B", and the 6.4 feet to 7.1 feet labeled "Z" (physical analysis only). The "A" sample physical analysis showed a composition of 84.5% finer than sand while the "B" sample showed 46.0% finer than sand and "Z" only 9.5 % finer than sand. Chemically the "A" sample contained higher levels of all chemicals of concern; most notable was total DDT. Sample "A" contained 198-ppb total DDT (SL 6.9-ppb) while sample "B" contained only 2.2-ppb total DDT.

Station WR-GC-42 This sample was an 18-foot core sample that was divided into 4 composite samples. Surface to 5.4 feet was labeled "A", 5.4 feet to 10.8 feet "B", 10.8 feet to 16.2 feet "C", and 16.2 feet to 18.0 feet "D". The "D" sample exceeded the SL (130-ppb) for PCBs, with an analysis of 246.0-ppb PCBs. The other composites were < 57-ppb PCBs.

Station WR-GC-43 Sample 43 was a 12.9 foot core sample that was divided into 3 composite samples (surface to 0.5 feet was wood chips lost during coring). Sample "A" was from 0.5 to 5.4 feet, sample "B" 5.4 feet to 10.7 feet and sample "Z" (physical analysis only) from 10.7 feet to 16.2 feet. The "A" sample contained 489.0-ppb lead, while its blind replicate WR-D contained 64.3-ppb and the "B" sample only 15.0-ppb. The "A" sample may have contained an isolated piece of lead.

These and other sites, which exceed the SL for contaminates of concern, would require careful further consideration if dredging and disposal were to take place.

7.3 Composite Samples, Field Replicates and Laboratory Quality Control

The Columbia River samples CR-BC-11/12 and CR-BC-66/67 were composite samples. Sample CR-BC- 75A was fine-grained material taken out of the same grab sample as CR-BC-75 (see Discussion, Columbia River Samples of Interest, above).

On the Willamette River samples WR-BC-12/13/14, WR-BC-16/17 and WR-BC-26/27/28 were composite samples. The following primary samples are matched with their blind replicate sample: WR-BC-01 & WR-A, WR-BC-10 & WR-B, WR-BC-29 & WR-C, WR-BC-43 & WR-D. Blind replicate samples were used as a laboratory quality check. The correlation of data between the primary and three replicates, WR-A, WR-B, WR-C (except P-450 on WR-C) was good. Sample WR-D did show good correlation on the physical analysis, pesticides/PCBs and P-450, but showed poor correlation with the primary sample on TOC, metals, and PAHs. Other laboratory controls used were surrogate samples, laboratory duplicates, matrix spike/matrix spike duplicate samples, laboratory control samples and method blanks. The percent recovery and relative percent differences were within acceptable limits, with few exceptions. The laboratory confirmed samples outside the laboratory control limits with a second confirming analysis.

7.4 Sample Location Maps

As previously mentioned sample location selection was based on the following: Station locations on the Columbia River were chosen from shoal areas as indicated on the most recent Channel Condition Surveys performed by the USACE, Portland District Hydrographic Survey Branch (Table 3). Station locations on the Willamette River were selected by Tom Rosetta of the Department of Environmental Quality (DEQ), Rick Vinning of Department of Ecology (DOE), and John Malek of the Environmental Protection Agency (EPA), Region 10 based upon shoals identified in the 1994 channel condition survey and proposed channel alignment. The sample location maps (Plates 1 –27) attached to this report show the actual sampling station location (see section 2.0 of this report for discussion of actual versus proposed location).

7.5 Radionuclides

As with all sediment quality evaluations a sequential approach called a tiered evaluation process was used to determine if there is a reason-to-believe radionuclides pose an unacceptable adverse effect to the environment or human health if dredged. This includes placement. The present evaluation approach involves tiers designed and used in a sequential manner for evaluating the suitability of dredged material for unconfined aquatic disposal. Material found suitable for open-water disposal is usually considered also suitable for upland disposal. At each tier a decision is made regarding the adequacy of the existing data to make a suitability determination. If the existing data is adequate for decision purposes, then there is no need to proceed to the next tier.

Tier I consists of compiling and evaluating existing information on specific dredging sites; determine if exclusion-from-testing or recency/frequency guidelines apply; and determine if there exists a reason-to-believe that significant contamination is present. The Lower Columbia River Bi-State program, conducted in 1993 by Tetra Tech, reported that "Radionuclides have probably been the most extensively studied contaminate in the Columbia River." Radionuclides occur naturally in the earth's crust and they also occur as a result of human activity. Significant sources of radionuclides to the Columbia River include historical and present releases from the Hanford plutonium production facility, fallout from historical above-ground nuclear weapons testing, and radionuclides fallout from the April 1986 Chernobyl nuclear power plant accident. The Trojan Nuclear Power Plant was not a significant source of radionuclides to the river based upon environmental monitoring.

For more than 40 years the U.S. Government produced plutonium for nuclear weapons at the Hanford Site in south central Washington State. During that time, Hanford released radioactive elements and other materials into the Columbia River. Columbia River water was used to cool up to 8 plutonium production reactors. The first three were built during World War II and five more were added between 1949 and 1955. The first reactor began operation in September 1944 and the last was shut down in January 1971. As various elements and chemicals passed through the reactor's cores with the cooling water they became radioactive. After leaving the cores, the cooling water went into retention basins then was discharged into the Columbia River.

Because of the construction of the 5 additional reactors and increased production levels of all the reactors increasing amounts of radioactivity was discharged to the Columbia River. The radioactive contamination levels in the Columbia River were highest from 1957 to 1964. Additional releases resulted from fuel element failure and flushing, reactor purging, of the cooling tubes.

There were two other factors that influenced the passage of radionuclides in the river; seasonal changes and the construction of dams. Summer and fall were likely peaks in exposure levels in river areas near Hanford due to low flows and warmer water. Dams slowed the flow of the river allowing more radioactive materials to adhere to the sediment trapped behind the dams. The radioactive materials were further decreased by decay before reaching the down river area.

According to the Technical Steering Panel of the Hanford Environmental Dose Reconstruction Project (TSP, 1994), there were five radionuclides that contributed 94 percent of the radiation exposure. The five were phosphorus-32, zinc-65, arsenic-76, neptunium-239 and sodium-24. There were many other radioactive materials released into the river, but they contributed much less radiation.

The USGS in cooperation with the US Atomic Energy Commission published a series of Geological Survey Professional Papers between 1973 and 1975 on Columbia River radionuclide contamination (USGS, 1973-1975). Field work began in 1962 and lasted through 1966. The purpose of the investigations was to determine the decay, distribution, and movement of radionuclides in the Columbia River. As part of the investigation, surveys were made of the distribution of radionuclides and sediments in the streambed between the reactors and The Dallas Dam in September 1965; between The Dallas and Bonneville Dams in October and November 1964; and between Bonneville Dam and Longview, Washington in April 1965. In addition, radionuclide concentrations and particle-size distributions of surficial sediment were observed for samples collected semimonthly during 1963, and intermittently at other times during 1962-1965, from the streambed at Pasco and Vancouver, Washington and Hood River, Oregon.

To provide information on the distribution of radionuclides in the estuary (Longview to the mouth of the Columbia River), the physical and radiological character of the streambed was investigated in 1965. Gross gamma radiation was measured in situ, and surficial samples and cores were obtained at 14 cross sections. These analyses correspond to the timeframe of maximum radionuclide discharge from Hanford, 1957-1964.

In the proposed project area (Portland, Oregon to the mouth of the Columbia River) the most abundant radionuclides measured were Cr^{51}, Zn^{65}, Sc^{46}, Ru^{106}, Mn^{54}, Co^{60}, and Zr^{95}- Nb^{95} which were approximately 6.2, 2.2, 0.2, 0.1, 0.07, 0.06, and 0.05 times, respectively, the concentration of naturally occurring K^{40}. The stratigraphic distribution of radionuclides was also found to vary considerably. Radionuclides tended to be distributed to the greatest depths in channels and on slopes and may extend more than 60 inches below the bed surface. However, on the average, 66 percent of the total amount of measured radionuclides (excluding K^{40}) was concentrated in the upper 8 inches of the streambed. While radionuclide concentrations varied greatly, generally the lowest were in channels and the highest were on slopes and flats.

Sediment texture influences the radionuclide content significantly. Radionuclide concentrations increased as the mean size of sediment decreased, as sediment became less well sorted, and as the skewness of the sediment size distribution changed from negative to positive. Main channel sediments are sands low in fines and organic content (see Table 5)

Over 60 different radionuclides have been reported in effluent from the Hanford reactors. At least six of these were discharged at relatively high concentrations and are relatively long-lived Cr^{51} (half-life 27.8 days), Zn^{65} (245 days), Sc^{46} (84 days), Mn^{54} (314 days), Co^{60} (5.3 years), and Sb^{124} (60 days). Radionuclides with longer half-lives were discharged in relatively low quantities [e.g., Pu^{239} (24,000 years), and Cs^{137} (30.2 years)]. Those radionuclides with half-lives shorter than 2.5 years that were released to the river prior to 1972 would be effectively gone.

The Oregon Hanford Waste Board feels that levels have dropped to well within health and safety standards, although traces of radioactive elements from Hanford can still be found in the river sediments today. The Washington Department of Health (WDH) in a March 1994, Special Report titled "Radioactivity in the Columbia River Sediment and Their Health Effects" (WDH, 1994) reviewed and presents an excellent summary of existing data provided by state agencies, federal agencies, and academic researchers. These data span the length of the river and the coastlines of Oregon and Washington. The WDH concludes that these data are sufficient to establish human health risks. Although traces of radioactive materials remain in the river, monitoring by the states of Oregon and Washington and others indicate that radionuclides do not currently pose a health hazard.

The short lived radionuclides are essentially gone and the artificial intermediate and long-lived radionuclides are at or near the lower limit of detection, regardless of sampling location. The 1994 WDH report in its Executive Summary found that:

> "The maximum radiation doses from surface sediments come from the Hanford Reach of the river. In general, the calculated dose, like the measured concentrations of artificial radioactivity, decline rapidly with distance from Hanford. In all cases the calculated doses are low and less than 1% of natural background. In fact, the risk from these doses are less than the risk associated with existing federal standards for radionuclides in drinking water and air emissions."

Based upon a Tier I review of existing information it was determined that there was not a reason-to-believe that dredging of the Columbia River Navigation Channel by an additional 3 feet would poses an unacceptable risk to the environment or human health due to radionuclides present in the sediment. No further testing at higher tiers is necessary.

8.0 Conclusions

The proposed material to be dredged from the mainstem of the Columbia River consists of clean sands low in fines and organic content. The areas identified consist of sand wave or cut line shoals formed by bedload transport. Material distribution in these shoals is homogeneous due to source and consistency of the hydraulic regime, which form the shoals.

The current sampling event data (Tables 5-10) confirms the "Exclusionary" ranking for the material in the Columbia River federal navigational channel. It also shows that the area from RM 74 to 88 and RM 99 to 106, that was previously ranked "low" due to lack of data, now fit the "exclusionary" ranking, also. Therefore, all samples taken inside the purposed federal channel in the Columbia River upheld the "exclusionary" ranking and would require no further testing before disposal under the guidelines of the DMEF and could be disposed of under either the CWA section 404 or the Marine Protection, Research and Sanctuaries Act (MPRSA) section 10.

Sediment testing is conducted in accordance with the laws, regulations, and guidance as discussed in previous comments. Coarse grained sediments are not subjected to chemical and higher tier testing unless there is a reason to believe the sediments could be contaminated with a chemical of concern. A primary factor in this determination is proximity to contamination sources. The need to chemically test Columbia River sediment samples, though not required, was conducted as part of this study. All data, both historical and current, was used in evaluating potential environmental impacts of dredged material management alternatives to meet the substantive and procedural requirements of the National Environmental Policy Act, The Clean Water Act and the Marine Protection, Research and Sanctuaries Act. This evaluation would make all material represented by this sampling event on the Columbia River suitable for unconfined aquatic disposal.

For the Willamette River portion of the project, all sediments regardless of physical properties were subjected to chemical testing. Of the 68 samples analyzed from the 43 sampling stations, 13 samples exceeded the SL for 1 or more contaminates. The material represented by these samples would not be suitable for unconfined aquatic disposal under Tier II testing SLs. These areas, if dredged, would be required to either under go biological testing under Tier III or be disposed of under guidelines and regulations for confined in-water or upland. Sampling and analyses of deep-water sites (12 locations, Grab-1 through 12) in the Willamette River show surface sediment to be contaminated with DDT and PAHs above the DMEF screening levels in several locations. These areas should be evaluated further for possible locations for dredged material disposal.

The local sponsors for the CRCD project have requested that the Willamette River dredging be delayed. If the harbor is listed as a "Super Fund" site no navigational maintenance or new work dredging can be conducted in the listed area under the CWA. If the harbor is not listed dredging for navigation channel deepening would not preclude cleanup activities but would enhance and perhaps extend the effort. The dredging in the Willamette River would require full compliance with the all laws including the CWA, ESA, and NEPA.

Table 1, CRCD Sediment Evaluation Report

Columbia River Channel Deepening
Proposed Sediment Sampling Locations

Sample	Longitude	Latitude	RM	Remarks
CR-BC-1	-123:59:03.3343	46:14:01.9406	6+00	Desdemona Shoal
CR-BC-2	-123:58:40.4168	46:13:53.8876	6+18	Desdemona Shoal
CR-BC-3	-123:58:21.3699	46:13:35.9257	6+40	Off Buoy 22
CR-BC-4	-123:56:00.2036	46:12:12.4797	9+10	Flavel Bar (Chem)
CR-BC-5	-123:54:10.8466	46:11:24.0717	11+00	Flavel Bar
CR-BC-6	-123:53:15.0373	46:11:30.4439	11+40	Flavel Bar
CR-BC-7	-123:52:13.3125	46:11:32.2848	12+30	Flavel Bar
CR-BC-8	-123:51:51.6669	46:11:24.7337	12+45	Flavel Bar (Chem)
CR-BC-9	-123:49:11.7802	46:11:49.6890	15+00	Upper Sands
CR-BC-10	-123:47:34.3607	46:12:26.5769	16+25	Upper Sands
CR-BC-11	-123:45:06.0607	46:13:18.6687	18+35	Tongue Pt. X-ing
CR-BC-12	-123:43:34.5881	46:13:49.2555	20+00	Tongue Pt. X-ing
CR-BC-13	-123:48:56.1150	46:17:08.7026	20+50	Tongue Pt. X-ing
CR-BC-14	-123:41:32.6230	46:14:51.4486	22+00	Tongue Pt. X-ing
CR-BC-15	-123:39:27.5695	46:15:23.5588	23+40	Miller Sands (L side)
CR-BC-16	-123:38:17.4846	46:15:35.0619	24+40	Miller Sands
CR-BC-17	-123:35:14.5464	46:15:22.4087	27+10	Pillar Rock
CR-BC-18	-123:33:31.3486	46:15:26.9171	28+30	Pillar Rock
CR-BC-19	-123:32:02.0550	46:15:40.1670	29+40	Pillar Rock
CR-BC-20	-123:29:16.2230	46:16:18.7428	32+05	Brooksfiel-Welch (L side)
CR-BC-21	-123:27:58.5393	46:16:05.1881	33+10	Skamokawa Bar (L side)
CR-BC-22	-123:26:17.2022	46:14:49.5667	33+10	ditto (L of Ctr., Chem)
CR-BC-23	-123:25:29.3459	46:12:33.2189	38+00	Puget Is. Bar
CR-BC-24	-123:25:38.0984	46:11:41.0153	39+00	Puget Is. Bar (R side, Chem)
CR-BC-25	-123:24:58.0377	46:10:15.4260	40+45	Wanna-Driscoll(L Ctr,Chem)
CR-BC-26	-123:23:14.5903	46:09:02.2613	42+40	ditto (L of Ctr., Chem)
CR-BC-27	-123:21:36.4559	46:08:41.7907	44+10	Wanna-Driscoll
CR-BC-28	-123:20:36.9378	46:08:32.5597	45+00	Wanna-Driscoll
CR-BC-29	-123:19:21.2834	46:08:32.0508	46+00	West Port Bar
CR-BC-30	-123:17:51.5459	46:08:37.8018	47+10	West port Bar
CR-BC-31	-123:16:52.1139	46:08:48.6908	48+00	West port Bar
CR-BC-32	-123:13:12.8288	46:10:14.6658	51+20	West port Bar
CR-BC-33	-123:09:35.6055	46:11:20.3455	54+30	Island Bar (L side)
CR-BC-34	-123:07:17.7356	46:11:07.9353	56+20	Stella-Fisher Bar (L side)
CR-BC-35	-123:06:15.6285	46:10:43.4611	57+20	ditto (R side, Chem)
CR-BC-36	-123:05:18.2519	46:10:09.7332	58+20	Stella-Fisher Bar
CR-BC-37	-123:11:29.7216	46:13:28.9081	59+10	Stella-Fisher Bar
CR-BC-38	-123:03:10.7658	46:09:15.3678	60+20	Walker Is. (L side)
CR-BC-39	-123:01:30.0908	46:08:26.9657	62+00	Walker Is.
CR-BC-40	-123:00:12.3010	46:07:58.3243	63+10	Slaughters Bar (Chem)
CR-BC-41	-122:59:29.9738	46:07:27.0209	64+00	Slaughters Bar Chem)
CR-BC-42	-122:58:38.1992	46:06:48.7298	65+00	Slaughters Bar
CR-BC-43	-122:57:52.6910	46:06:25.0230	65+40	Slaughters Bar
CR-BC-44	-122:57:20.4945	46:06:19.3331	66+10	R Turning Basin Lower
CR-BC-45	-122:56:30.9667	46:06:01.3646	66+50	R Turning Basin Upper

Columbia River Channel Deepening
Proposed Sediment Sampling Locations

CR-BC-46	-122:56:09.8545	46:05:50.3446	67+15	L Dobelbower Bar (R side)
CR-BC-47	-122:53:00.0084	46:03:51.2050	70+45	U Dobelbower Bar
CR-BC-48	-122:52:46.5037	46:03:01.3898	71+45	U Dobelbower Bar
CR-BC-49	-122:52:17.2524	46:01:43.0832	73+25	U Dobelbower Bar (R side)
CR-BC-50	-122:51:07.9427	46:00:43.8057	74+50	Kalama (R of Ctr.)
CR-BC-51	-122:50:47.3695	45:59:53.3304	75+50	Kalama (R of Ctr.)
CR-BC-52	-122:50:21.3255	45:59:04.7564	76+50	@E8 on BiState (Chem)
CR-BC-53	-122:48:36.9406	45:57:26.6275	79+20	L Martin Is. Bar (L side)
CR-BC-54	-122:48:17.0262	45:56:23.2216	80+35	U Martin Is. Bar (L side)
CR-BC-55	-122:48:25.1414	45:55:07.9420	82+08	U Martin Is. Bar (Chem)
CR-BC-56	-122:48:25.0157	45:54:23.5578	83+00	U Martin Is. Bar (Chem)
CR-BC-57	-122:48:82.-----	45:54:32.------	83+34	@E9D on BiState (Chem)
CR-BC-58	-122:47:54.8348	45:53:04.4499	84+31	Jct w/ St. Helens Ch (Chem)
CR-BC-59	-122:47:25.0667	45:52:29.2106	85+20	St Helens Bar (L side, Chem)
CR-BC-60	-122:47:10.1016	45:52:07.1731	85+45	St Helens Bar (L side)
CR-BC-61	-122:47:04.2865	45:51:21.7615	86+40	ditto (L sideslope, Chem)
CR-BC-62	-122:47:15.7772	45:50:19.6795	88+00	Warrior Rock Bar
CR-BC-63	-122:47:35.6691	45:49:30.0103	89+00	Warrior Rock Bar (R side)
CR-BC-64	-122:47:33.9660	45:48:40.4233	90+00	Henrici Bar (R side)
CR-BC-65	-122:47:05.5824	45:47:53.7864	91+00	Henrici Bar
CR-BC-66	-122:46:28.2783	45:47:08.5875	92+00	Henrici Bar (L of Ctr.)
CR-BC-67	-122:45:51.3934	45:46:25.2233	93+00	Henrici Bar
CR-BC-68	-122:45:34.4431	45:45:36.7177	93+50	Henrici Bar (R of Ctr.)
CR-BC-69	-122:45:33.6004	45:44:42.5466	95+00	Henrici Bar
CR-BC-70	-122:45:36.7032	45:43:51.4174	96+00	Henrici Bar
CR-BC-71	-122:45:54.2874	45:43:00.7651	97+00	Willow Bar
CR-BC-72	-122:46:11.6581	45:42:10.0429	98+00	Willow Bar
CR-BC-73	-122:46:20.5107	45:41:00.6805	99+20	Morgan Bar (R of Ctr, Chem)
CR-BC-74	-122:46:27.7855	45:41:00.0435	99+20	Morgan Bar (Ctr. Ch, Chem)
CR-BC-75	-122:46:31.9109	45:40:59.6139	99+20	Morgan Bar (L side, Chem)
CR-BC-76	-122:46:07.9882	45:40:09.1738	100+20	Morgan Bar (R of Ctr)
CR-BC-77	-122:46:03.8366	45:39:47.0415	100+45	Morgan Bar (L side)
CR-BC-78	-122:45:35.0403	45:39:22.6433	101+25	Morgan Bar (R side)
CR-BC-79	-122:44:39.0406	45:38:50.7520	102+25	L Vancouver (R side)
CR-BC-80	-122:43:45.1358	45:38:37.8835	103+12	L Vancouver (R side, Chem)
CR-BC-81	-122:43:03.0185	45:38:27.3920	103+45	L Vancouver (R side)
CR-BC-82	-122:43:04.5671	45:38:25.2145	103+45	L Vancouver (Ctr. Channel)
CR-BC-83	-122:43:05.7394	45:38:23.1613	103+45	L Vancouver (L side)
CR-BC-84	-122:42:40.6247	45:38:19.6836	104+10	U Vanc. (R/S, Chem. Cu spill)
CR-BC-85	-122:42:16.1175	45:38:09.6405	104+10	U Vanc. (R/S, Chem.Cu spill)
CR-BC-86	-122:41:24.1493	45:37:38.6678	105+25	Downsteram RR Brdg(Chem)
CR-BC-87	-122:41:07.3576	45:37:29.9672	105+40	Upstream RR Brdg
CR-BC-88	-122:40:28.6568	45:37:16.7597	106+20	D/S of I-205 Br. (R/C, Chem)
CR-BC-89	-122:40:32.7099	45:37:11.1850	106+20	Downstream of I-205 (L/C)

Table 2, CRCD Sediment Evaluation Report

Columbia River Channel Deepening
Actual Sediment Sampling Locations

Sample	Longitude	Latitude	RM	Remarks
CR-BC-1	-123:59:08.3	46:14:00.7	6+00	Desdemona Shoal
CR-BC-2	-123:58:41.1	46:13:54.6	6+18	Desdemona Shoal
CR-BC-3	-123:58:22.4	46:13:36.6	6+40	Off Buoy 22
CR-BC-4	-123:56:09.1	46:12:11.0	9+10	Flavel Bar (Chem)
CR-BC-5	-123:54:09.1	46:11:24.0	11+00	Flavel Bar
CR-BC-6	-123:53:03.3	46:11:30.5	11+40	Flavel Bar
CR-BC-7	-123:52:13.1	46:11:32.2	12+45	Flavel Bar (Chem)
CR-BC-8	-123:52:40.4	46:11:51.8	12+30	Flavel Bar
CR-BC-9	-123:49:27.2	46:11:80.0	15+00	Upper Sands
CR-BC-10	-123:47:33.6	46:12:22.8	16+25	Upper Sands
CR-BC-11	-123:45:06.4	46:13:18.5	18+35	Tongue Pt. X-ing
CR-BC-12	-123:43:82.1	46:13:74.0	20+00	Tongue Pt. X-ing
CR-BC-13	-123:42:79.8	46:14:23.7	20+50	Tongue Pt. X-ing
CR-BC-14	-123:41:79.0	46:14:74.8	22+00	Tongue Pt. X-ing
CR-BC-15	-123:39:32.9	46:15:44.5	23+40	Miller Sands (L side)
CR-BC-16	-123:38:25.9	46:15:57.9	24+40	Miller Sands
CR-BC-17	-123:35:24.2	46:15:35.2	27+10	Pillar Rock
CR-BC-18	-123:33:61.0	46:15:43.1	28+30	Pillar Rock
CR-BC-19	-123:32:02.3	46:15:64.3	29+40	Pillar Rock
CR-BC-20	-123:29:16.0	46:16:27.5	32+05	Brooksfield-Welch (L side)
CR-BC-21	-123:27:58.4	46:16:05.1	33+10	Skamokawa Bar (L side)
CR-BC-22	-123:26:17.4	46:14:85.9	33+10	ditto (L of Ctr., (Chem)
CR-BC-23	-123:25:72.2	46:12:60.0	38+00	Puget Is. Bar
CR-BC-24	-123:25:72.2	46:11:50.0	39+00	Puget Is. Bar (R side, (Chem)
CR-BC-25	-123:25:26.3	46:10:33.9	40+45	Wanna-Driscoll(L Ctr, (Chem)
CR-BC-26	-123:23:36.0	46:09:06.5	42+40	ditto (L of Ctr., (Chem)
CR-BC-27	-123:21:64.0	46:08:68.7	44+10	Wanna-Driscoll
CR-BC-28	-123:20:68.4	46:08:53.7	45+00	Wanna-Driscoll
CR-BC-29	-123:19:50.5	46:08:52.8	46+00	West Port Bar
CR-BC-30	-123:19:50.5	46:08:69.2	47+10	West port Bar
CR-BC-31	-123:16:49.8	46:08:88.6	48+00	West port Bar
CR-BC-32	-123:13:30.0	46:10:24.4	51+20	West port Bar
CR-BC-33	-123:09:77.7	46:11:33.5	54+30	Island Bar (L side)
CR-BC-34	-123:07:60.4	46:11:14.0	56+20	Stella-Fisher Bar (L side)
CR-BC-35	-123:07:47.5	46:10:76.1	57+20	ditto (R side, (Chem)
CR-BC-36	-123:05:35.9	46:10:12.9	58+20	Stella-Fisher Bar
CR-BC-37	-123:04:59.5	46:09:71.7	59+10	Stella-Fisher Bar
CR-BC-38	-123:03:46.8	46:09:29.0	60+20	Walker Is. (L side)
CR-BC-39	-123:01:85.0	46:08:52.4	62+00	Walker Is.
CR-BC-40	-123:00:36.9	46:07:99.3	63+10	Slaughters Bar (Chem)
CR-BC-41	-122:59:59.2	46:07:41.0	64+00	Slaughters Bar (Chem)
CR-BC-42	-122:58:76.7	46:06:70.7	65+00	Slaughters Bar
CR-BC-43	-122:58:02.9	46:06:41.0	65+40	Slaughters Bar
CR-BC-44	-122:57:47.0	46:06:36.4	66+10	R Turning Basin Lower
CR-BC-45	no sample – 3 attempts		66+50	R Turning Basin Upper

Table 2, CRCD Sediment Evaluation Report

Columbia River Channel Deepening
Actual Sediment Sampling Locations

CR-BC-46	-122:56:17.8	46:05:79.2	67+15	L Dobelbower Bar (R side)
CR-BC-47	-122:53:10.4	46:03:83.6	70+45	U Dobelbower Bar
CR-BC-48	-122:52:86.5	46:03:11.3	71+45	U Dobelbower Bar
CR-BC-49	-122:52:41.3	46:01:81.0	73+25	U Dobelbower Bar (R side)
CR-BC-50	-122:51:15.4	46:00:74.9	74+50	Kalama (R of Ctr.)
CR-BC-51	-122:50:32.4	45:59:81.6	75+50	Kalama (R of Ctr.)
CR-BC-52	-122:50:42.5	45:59:03.7	76+50	@E8 on BiState (Chem)
CR-BC-53	-122:48:71.7	45:57:48.3	79+20	L Martin Is. Bar (L side)
CR-BC-54	-122:48:33.0	45:56:38.6	80+35	U Martin Is. Bar (L side)
CR-BC-55	-122:48:47.0	45:55:18.1	82+08	U Martin Is. Bar (Chem)
CR-BC-56	-122:48:52.0	45:54:36.2	83+00	U Martin Is. Bar (Chem)
CR-BC-57	-122:48:82.3	45:54:32.1	83+34	@E9D on BiState (Chem)
CR-BC-58	-122:47:91.8	45:53:00.1	84+31	Jct w/ St. Helens Ch (Chem)
CR-BC-59	-122:47:46.7	45:52:47.5	85+20	St Helens Bar (L side, (Chem)
CR-BC-60	-122:47:28.4	45:52:09.7	85+45	St Helens Bar (L side)
CR-BC-61	-122:47:20.0	45:51:48.2	86+40	ditto (L sideslope, (Chem)
CR-BC-62	-122:47:30.7	45:50:36.6	88+00	Warrior Rock Bar
CR-BC-63	-122:47:61.0	45:49:58.2	89+00	Warrior Rock Bar (R side)
CR-BC-64	-122:47:61.0	45:48:78.2	90+00	Henrici Bar (R side)
CR-BC-65	-122:47:28.4	45:48:00.7	91+00	Henrici Bar
CR-BC-66	-122:46:54.5	45:47:04.7	92+00	Henrici Bar (L of Ctr.)
CR-BC-67	-122:45:96.9	45:46:52.8	93+00	Henrici Bar
CR-BC-68	-122:45:70.9	45:45:66.7	93+50	Henrici Bar (R of Ctr.)
CR-BC-69	-123:45:67.7	45:44:73.7	95+00	Henrici Bar
CR-BC-70	-123:45:68.9	45:43:82.2	96+00	Henrici Bar
CR-BC-71	-123:46:00.0	45:42:97.4	97+00	Willow Bar
CR-BC-72	-123:46:27.8	45:42:14.0	98+00	Willow Bar
CR-BC-73	-123:46:41.3	45:40:99.3	99+20	Morgan Bar (R of Ctr, (Chem)
CR-BC-74	-123:46:54.5	45:40:99.6	99+20	Morgan Bar (Ctr. Ch, (Chem)
CR-BC-75	-123:46:61.7	45:41:00.0	99+20	Morgan Bar (L side, (Chem)
CR-BC-76	-123:46:21.0	45:40:13.0	100+20	Morgan Bar (R of Ctr)
CR-BC-77	-122:46:16.7	45:39:82.0	100+45	Morgan Bar (L side)
CR-BC-78	-122:45:62.7	45:39:31.9	101+25	Morgan Bar (R side)
CR-BC-79	-122:44:73.2	45:38:82.0	102+25	L Vancouver (R side)
CR-BC-80	-122:43:45.5	45:38:54.1	103+12	L Vancouver (R side, (Chem)
CR-BC-81	-122:43:10.1	45:38:43.8	103+45	L Vancouver (R side)
CR-BC-82	-122:43:17.5	45:38:42.2	103+45	L Vancouver (Ctr. Channel)
CR-BC-83	-122:43:17.4	45:38:36.5	103+45	L Vancouver (L side)
CR-BC-84	-122:42:74.4	45:38:30.1	104+10	U Vancouver (R side, (Chem) Copper spill)
CR-BC-85	-122:42:36.0	45:38:14.4	104+30	U Vancouver (R side, (Chem) Copper spill)
CR-BC-86	-122:41:53.0	45:37:66.1	105+25	Downstream RR Brdg (Chem)
CR-BC-87	-122:41:53.0	45:37:50.8	105+40	Upstream RR Brdg
CR-BC-88	-122:40:53.1	45:37:25.7	106+20	Downstrm of I-205 Brdg (R of Ctr., (Chem)
CR-BC-89	-122:40:54.1	45:37:19.5	106+20	Downstrm of I-205 (L of Ctr)

Table 3, CRCD Sediment Evaluation Report

Columbia River
Channel Condition Survey

Drawing #	Date	River Mile	Name
CL-28-211	17-Mar-97	28+40 to 32+35	Brooksfield-Welch Island Reach
CL-26-262	28-Apr-97	25+00 to 28+40	Pillar Rock Ranges
CL-21-285	15-Jan-97	21+20 to 25+20	Miller Sands Channel
CL-18-336	07-Oct-96	17+30 to 21+20	Tongue Point Crossing
CL-9-261	13-Nov-96	9+30 to 13+50	Flavel Bar
CL-14-207	07-Mar-97	13+30 to 17+30	Upper Sands
CL-4-96	06-Mar-97	2+30 to 6+25	Lower Desdemona Shoal
MC-1-680	09-Aug-96	-3+00 to 5+30	Entrance & Sand Island Ranges
CL-5-357	13-Nov-96	6+20 to 10+20	Upper Desdemona Shoal
CL-105-174	07-Jan-97	103+30 to 107+30	Vancouver Turning Basin
CL-102-259	06-Oct-96	100+40 to 104+50	Lower Vancouver Bar
CL-97-238	25-Sep-96	97+35 to 102+20	Morgan Bar
CL-94-255	16-Apr-97	93+40 to 97+45	Willow Bar
CL-44-243	11-Feb-97	44+20 to 48+20	Westport Bar
CL-40-261	13-Mar-97	40+20 to 44+30	Wauna & Driscoll Ranges
CL-36-235	13-Mar-97	36+30 to 40+50	Puget Island Bar
CL-33-244	17-Mar-97	32+30 to 36+40	Skamokawa Bar
CL-59-243	30-Apr-97	59+20 to 63+15	Walker Island Reach
CL-56-258	30-Apr-97	55+20 to 59+25	Stella-Fisher Bar
CL-54-192	01-May-97	51+40 to 55+45	Gull Island Bar
CL-50-211	12-Mar-97	47+55 to 51+50	Eureka Bar
CL-90-237	04-Mar-97	90+05 to 94+15	Henrici Bar
CL-87-201	04-Mar-97	86+30 to 90+40	Warrior Rock
CL-84-262	05-Mar-97	83+30 to 87+40	St. Helens Bar
CL-78-441	14-Jan-97	80+05 to 84+10	Upper Martin Island Bar
CL-78-436	22-Oct-96	76+20 to 80+25	Lower Martin Island Bar
CL-73-247	26-Mar-97	72+30 to 76+40	Kalama Ranges
CL-67-579	23-Jan-97	69+10 to 73+20	Upper Dobelbower Bar
CL-67-582	10-Mar-97	66+20 to 70+20	Lower Dobelbower Bar
CL-64-270	30-Apr-97	63+05 to 67+05	Slaughters Bar

Note: These survey maps were used to determine sediment sample locations representative of shoal areas.

Table 4, CRCD Sediment Evaluation Report

Columbia River Channel Deepening
Willamette River Sediment Sample Locations

Sample	Longitude	Latitude	RM	Remarks
WR-BC-1	-122:45:44.3362	45:39:13.3370	0.1	Rt. Mouth (Box Core)
WR-GC-2	-122:45:54.9805	45:39:16.5667	0.1	Lt. Mouth (Gravity Core)
WR-BC-3	-122:46:02.3906	45:39:02.1708	0.4	Lt.
WR-GC-4	-122:46:06.7203	45:38:43.8529	0.8	Lt. D/S Term 5 (-4 w/-5)
WR-GC-5	-122:46:08.0703	45:38:44.7709	0.8	Rt. D/S Term 5 (-4 w/-5)
WR-GC-6	-122:46:20.7350	45:38:42.8349	0.95	~ mid-channel
WR-BC-7	-122:46:57.3869	45:38:19.4082	1.6	~ mid-channel
WR-BC-8	-122:47:06.8303	45:38:12.1734	1.7	~ mid-channel
WR-BC-9	-122:47:16.6692	45:38:03.4129	2.05	~ mid-channel
WR-BC-10	-122:47:28.2057	45:37:41.3380	2.45	~ mid-channel
WR-GC-11	-122:47:26.2800	45:37:15.0665	2.9	~ mid-channel
WR-BC-12	-122:47:17.0763	45:36:57.6300	3.4	Rt. D/S Term 4; Composite
WR-BC-13	-122:47:11.6621	45:36:57.1153	3.4	Lt. Of C/L; Comp.-12,-14
WR-BC-14	-122:47:16.5328	45:36:52.2947	3.5	Lt. Of C/L; Comp.-12,-14
WR-BC-15	-122:47:14.0216	45:36:39.3717	3.8	Rt. Of C/L
WR-BC-16	-122:47:02.7247	45:36:23.8457	4.1	~C/L; Composite –16,-17
WR-BC-17	-122:46:58.8536	45:36:18.1072	4.4	~C/L; Composite –16,-17
WR-GC-18	-122:46:41.0228	45:36:11.5496	5.1	Rt. Of C/L
WR-GC-19	-122:46:17.4757	45:35:35.8326	5.1	Lt. Of C/L
WR-BC-20	-122:46:19.2367	45:35:30.2858	5.15	Rt. Of C/L
WR-BC-21	-122:45:45.1441	45:35:04.2830	5.9	Lt. D/S Moorings
WR-BC-22	-122:45:25.4092	45:34:53.8719	6.2	Lt. D/S Moorings
WR-BC-23	-122:45:08.0541	45:34:47.6289	6.5	~ mid-channel
WR-GC-24	-122:44:52.1496	45:34:38.5182	6.7	Rt. D/S RR Br.
WR-GC-25	-122:44:52.4081	45:34:41.5870	6.7	Lt. D/S RR Br.
WR-BC-26	-122:44:43.0783	45:34:33.8529	6.9	Lt. D/S RR Br.; Comp-26,-28
WR-BC-27	-122:44:37.7302	45:34:33.4267	7.0	Rt. D/S RR Br.; Comp-26,-28
WR-BC-28	-122:44:35.0715	45:34:29.1617	7.1	~ mid-channel; Comp-26,-28
WR-BC-29	-122:44:19.6199	45:34:19.7144	7.5	~ mid-channel
WR-GC-30	-122:43:12.1918	45:33:37.2890	8.5	Swan Is.
WR-GC-31	-122:42:50.2430	45:33:26.9055	8.9	Swan Is.
WR-GC-32	-122:41:40.8248	45:33:02.8328	10.0	Rt. D/S Turning Basin
WR-GC-33	-122:41:35.4903	45:32:55.6554	10.1	Rt. U/S Turning Basin
WR-GC-34	-122:41:48.2905	45:32:56.4872	10.0	Lt. D/S Turning Basin
WR-GC-35	-122:41:42.6042	45:32:52.9740	10.1	Rt. U/S Turning Basin
WR-BC-36	-122:41:26.2867	45:32:45.0068	10.3	~ mid-channel
WR-GC-37	-122:40:49.2764	45:32:13.2822	11.1	Lt. Of C/L
WR-GC-38	-122:40:43.1427	45:32:09.5219	11.2	C/L D/S Turning Basin
WR-GC-39	-122:40:25.7998	45:31:57.7696	11.65	C/L U/S Turning Basin
WR-CD-40	-122:40:37.7078	45:32:08.9439	11.3	Rt. D/S Turning Basin (Core Drill)
WR-CD-41	-122:40:40.4862	45:32:04.8735	11.35	Lt. D/S Turning Basin (Core Drill)
WR-CD-42	-122:40:35.1566	45:31:59.3912	11.5	Lt. U/S Turning Basin (Core Drill)
WR-CD-43	-122:40:26.1315	45:32:03.1942	11.55	Rt. U/S Turning Basin (Core Drill)

Table 5, CRCD Sediment Evaluation Report **Sampled June 2-5, 1997**

Columbia River – Physical Analysis

Site	*Water Depth	RM	Mean	Median	Sand	vfsand	Silt	Clay	Vol Solids	Solids	TOC
			mm	mm	% finer			%	%	%	%
CR-BC-01	49.2	6+00	0.47	0.42	11.3	3.8	2.5	0.0	1.0		
CR-BC-02	47.6	6+18	0.27	0.26	47.8	1.3	0.7	0.0	0.6		
CR-BC-03	37.3	6+40	0.31	0.30	32.2	0.5	0.0	0.0	0.6		
CR-BC-04	44.8	9+10	0.16	0.17	90.1	21.7	14.3	3.2	1.5		
CR-BC-05	41.3	11+00	0.19	0.18	83.4	10.2	5.9	1.6	0.9	74.4	0.16
CR-BC-06	39.0	11+40	0.38	0.36	16.9	0.5	0.1	0.0	0.0		
CR-BC-07	32.7	12+45	0.08	0.05	91.3	70.1	59.1	15.4	4.0	66.3	1.29
CR-BC-08	43.6	12+30	0.38	0.36	10.9	0.2	0.0	0.0	0.5		
CR-CB-09	46.9	15+00	0.33	0.32	26.5	0.9	0.5	0.0	0.7		
CR-CB-10	23.0	16+25	0.33	0.32	26.9	1.2	0.5	0.0	0.0		
CR-BC-11/12	50/48	18+35	0.36	0.32	31.9	0.2	0.4	0.0	0.6		
CR-BC-11/12	50/48	20+00	0.29	0.27	41.9	1.3	0.1	0.0	0.6		
CR-BC-13	46.0	20+50	0.52	0.46	3.3	0.4	0.2	0.0	0.6		
CR-BC-14	46.3	22+00	0.41	0.38	9.1	0.7	0.5	0.0	0.0		
CR-BC-15	44.2	23+40	0.44	0.34	37.0	1.9	0.4	0.0	0.7		
CR-BC-16	43.5	24+40	0.36	0.35	12.5	0.2	0.1	0.0	0.7		
CR-BC-17	48.8	27+10	0.85	0.62	4.7	0.5	0.4	0.0	0.6		
CR-BC-18	45.0	28+30	0.22	0.21	70.7	2.1	0.3	0.0	0.0		
CR-BC-19	44.2	29+40	0.18	0.17	94.4	10.3	0.3	0.0	0.7		
CR-BC-20	41.3	32+05	0.33	0.32	22.1	0.5	0.2	0.0	0.6		
CR-BC-21	44.3	33+10	0.66	0.54	7.0	0.5	0.3	0.0	0.6		
CR-BC-22	39.4	35+10	0.33	0.32	27.0	0.6	0.5	0.0	0.7	73.7	<0.05
CR-BC-23	41.9	38+00	0.31	0.30	31.1	0.9	0.5	0.0	0.0		
CR-BC-24	40.0	39+00	0.34	0.33	19.4	0.7	0.4	0.0	0.6	72.8	<0.05
CR-BC-25	39.4	40+45	0.28	0.27	42.2	1.7	0.0	0.0	0.4	77.1	<0.05
CR-BC-26	43.7	42+40	0.33	0.32	25.2	0.9	0.6	0.0	0.6		
CR-BC-27	42.3	44+10	0.33	0.32	24.4	0.5	0.2	0.0	0.0		
CR-BC-28	46.2	45+00	0.41	0.37	10.8	0.7	0.3	0.0	0.0		
CR-BC-29	45.9	46+00	0.28	0.26	46.5	1.4	0.2	0.0	0.6		
CR-BC-30	39.5	47+10	0.35	0.34	11.1	0.2	0.1	0.0	0.0		
CR-BC-31	43.2	48+00	0.61	0.53	3.2	0.7	0.6	0.0	0.5		
CR-BC-32	41.9	51+20	0.78	0.73	1.1	0.2	0.1	0.0	0.0		
CR-BC-33	43.7	54+30	0.65	0.57	7.3	0.5	0.4	0.0	0.0		
CR-BC-34	30.5	56+20	0.37	0.35	14.9	0.6	0.4	0.0	0.4		
CR-BC-35	37.2	57+20	0.41	0.38	8.3	0.3	0.0	0.0	0.4	72.0	<0.05
CR-BC-36	37.2	58+20	0.46	0.41	8.1	0.4	0.3	0.0	0.0		
CR-BC-37	42.1	59+10	0.45	0.40	7.5	0.1	0.0	0.0	0.0		
CR-BC-38	31.1	60+20	0.40	0.37	10.7	0.1	0.0	0.0	0.5		
CR-BC-39	33.1	62+00	0.68	0.48	6.4	0.5	0.4	0.0	0.0		
CR-BC-40	42.1	63+10	0.72	0.55	5.3	0.2	0.1	0.0	0.4	86.5	<0.05
CR-BC-41	37.0	64+00	0.56	0.49	5.3	0.7	0.6	0.0	0.3	87.2	<0.05
CR-BC-42	35.1	65+00	0.49	0.42	6.4	0.1	0.1	0.0	0.0		
CR-BC-43	38.1	65+40	1.17	0.86	4.0	0.2	0.1	0.0	0.0		
CR-BC-44 **	45.1	66+10	0.34	0.33	17.4	0.7	0.5	0.0	0.2		
CR-BC-46	36.1	67+15	2.22	1.79	0.3	0.1	0.1	0.0	0.0		

Note: The symbol " < " denotes a non-detect at the numerical level listed.
*Water Depth corrected to Columbia River Datum.

Table 5, CRCD Sediment Evaluation Report **Sampled June 2-5, 1997**

Columbia River – Physical Analysis

Site	*Water Depth	RM	Mean mm	Median mm	Sand % finer	vfsand % finer	Silt % finer	Clay %	Vol Solids %	Solids %	TOC %
CR-BC-47	46.1	70+45	0.34	0.33	23.4	0.4	0.3	0.0	0.4		
CR-BC-48	46.2	71+45	0.74	0.69	2.4	0.9	0.8	0.0	0.6		
CR-BC-49	40.2	73+25	1.33	1.03	0.3	0.1	0.1	0.0	0.5		
CR-BC-50	43.2	74+50	0.25	0.23	58.5	7.6	0.5	0.0	0.5		
CR-BC-51	45.2	75+50	0.53	0.46	2.0	0.2	0.2	0.0	0.3		
CR-BC-52	40.2	76+50	0.36	0.35	15.7	0.3	0.1	0.0	0.5	73.4	<0.05
CR-BC-53	44.2	79+20	0.87	0.76	3.8	0.5	0.2	0.0	0.6		
CR-BC-54	39.2	80+35	1.77	1.33	2.6	0.2	0.2	0.0	0.5		
CR-BC-55	46.2	82+08	0.58	0.45	9.0	0.2	0.0	0.0	0.5	73.9	<0.05
CR-BC-56	42.2	83+00	0.70	0.57	4.8	0.3	0.2	0.0	0.7	75.7	0.07
CR-BC-57	12.2	83+34	0.10	0.10	98.2	66.9	24.6	3.7	2.6	66.2	0.76
CR-BC-58	48.2	84+31	0.35	0.34	19.1	0.5	0.2	0.0	0.0		
CR-BC-59	43.2	85+20	0.72	0.66	2.8	0.4	0.3	0.0	0.4	87.4	<0.05
CR-BC-60	36.2	85+45	0.65	0.62	4.5	0.7	0.6	0.0	0.7		
CR-BC-61	29.2	86+40	0.86	0.70	5.5	0.6	0.5	0.0	0.6	80.0	<0.05
CR-BC-62	43.2	88+00	0.72	0.69	1.7	0.5	0.4	0.0	0.5		
CR-BC-63	36.2	89+00	0.27	0.25	48.7	2.1	0.5	0.0	0.2		
CR-BC-64	40.2	90+00	0.36	0.35	15.0	0.6	0.3	0.0	0.0		
CR-BC-65	42.2	91+00	0.72	0.63	3.8	0.4	0.3	0.0	0.5		
CR-BC-66/67	39.2,44.2	92+00	0.71	0.66	3.1	0.4	0.3	0.0	0.6		
CR-BC-66/67	39.2,44.2	93+00	0.30	0.29	34.2	0.9	0.2	0.0	0.4		
CR-BC-68	43.2	93+50	0.42	0.39	6.7	0.3	0.1	0.0	0.4		
CR-BC-69	46.1	95+00	0.72	0.66	4.0	0.5	0.4	0.0	0.0		
CR-BC-70	40.1	96+00	0.51	0.42	16.1	0.4	0.0	0.0	0.6		
CR-BC-71	48.1	97+00	1.24	0.96	0.9	0.2	0.1	0.0	0.7		
CR-BC-72	48.1	98+00	0.86	1.70	0.2	0.1	0.0	0.0	0.5		
CR-BC-73	40.1	99+20	0.77	0.63	8.0	0.8	0.4	0.0	0.6	74.3	0.06
CR-BC-74	50.1	99+20	0.99	0.84	1.1	0.3	0.2	0.0	0.8	91.2	<0.05
CR-BC-75	52.1	99+20	3.07	0.83	3.6	0.8	0.5	0.0	0.7	75.2	0.12
CR-BC-75A	52.1	99+20	0.04	0.03	98.3	96.7	77.3	10.5	4.6		
CR-BC-76	47.1	100+20	0.08	0.03	87.7	79.3	68.2	12.3	7.1	53.0	2.26
CR-BC-77	44.1	100+45	0.58	0.51	4.5	0.3	0.1	0.0	0.5		
CR-BC-78	56.1	101+25	0.51	0.40	20.0	0.7	0.2	0.0	0.7		
CR-BC-79	48.1	102+25	0.68	0.41	24.3	0.5	0.1	0.0	0.5		
CR-BC-80	45.1	103+12	0.44	0.35	31.2	0.6	0.1	0.0	0.6	73.1	0.06
CR-BC-81	46.1	103+45	0.31	0.29	39.6	0.6	0.1	0.0	0.5		
CR-BC-82	46.1	103+45	0.33	0.32	28.1	0.4	0.1	0.0	0.8		
CR-BC-83	45.1	103+45	0.32	0.31	26.4	0.4	0.3	0.0	0.9		
CR-BC-84	46.1	104+10	0.34	0.32	30.6	0.6	0.1	0.0	0.6	74.9	0.08
CR-BC-85	45.1	104+30	0.35	0.33	26.0	0.3	0.0	0.0	0.6	76.4	0.07
CR-BC-86	30.1	105+25	1.04	0.82	1.2	0.1	0.1	0.0	0.5	84.1	0.07
CR-BC-87	36.1	105+40	1.30	1.11	0.4	0.1	0.0	0.0	0.5		
CR-BC-88	39.1	106+20	0.89	0.73	1.1	0.1	0.0	0.0	0.5	88.9	<0.05
CR-BC-89	34.1	106+20	0.59	0.51	2.9	0.3	0.3	0.0	0.6		

Note: The symbol " < " denotes a non-detect at the numerical level listed.
*Water Depth corrected to Columbia River Datum.

Table 6, CRCD

Columbia River- Metals Analysis

Sediment Evaluation Report

Site	RM	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	AVS
					mg/kg (ppm)						%
CR-BC-05	11+00	3.0	<0.8	11.0	7.0	4.0	<0.05	13.0	<0.6	40.0	0.7
CR-BC-07	12+45	3.0	<0.8	14.0	17.0	7.0	<0.05	17.0	<0.6	66.0	61
CR-BC-22	35+10	2.0	<0.8	7.0	7.0	3.0	<0.05	10.0	<0.6	46.0	<0.7
CR-BC-24	39+00	2.0	<0.8	6.0	6.0	2.0	<0.05	12.0	<0.6	38.0	<0.7
CR-BC-25	40+45	1.0	<0.8	6.0	6.0	2.0	<0.05	10.0	<0.6	36.0	<0.7
CR-BC-35	57+20	2.0	<0.8	4.0	8.0	2.0	<0.05	8.0	<0.6	34.0	<0.7
CR-BC-40	63+10	1.0	<0.8	3.0	8.0	1.0	<0.05	7.0	<0.6	28.0	<0.6
CR-BC-41	64+00	2.0	<0.8	4.0	6.0	2.0	<0.05	6.0	<0.6	32.0	<0.6
CR-BC-52	76+50	2.0	<0.8	6.0	5.0	3.0	<0.05	7.0	<0.6	43.0	<0.7
CR-BC-55	82+08	2.0	<0.8	5.0	6.0	3.0	<0.05	9.0	<0.6	40.0	<0.7
CR-BC-56	83+00	2.0	<0.8	5.0	6.0	3.0	<0.05	9.0	<0.6	38.0	<0.7
CR-BC-57	83+34	2.0	<0.8	21.0	21.0	8.0	<0.05	21.0	1.0	85.0	0.9
CR-BC-59	85+20	2.0	<0.8	4.0	5.0	2.0	<0.05	7.0	<0.6	28.0	<0.6
CR-BC-61	86+40	2.0	<0.8	4.0	4.0	2.0	<0.05	7.0	<0.6	32.0	<0.7
CR-BC-73	99+20	2.0	<0.8	6.0	9.0	2.0	<0.05	7.0	<0.6	38.0	<0.7
CR-BC-74	99+20	2.0	<0.8	5.0	7.0	2.0	<0.05	5.0	<0.6	32.0	<0.7
CR-BC-75	99+20	1.0	<0.8	4.0	7.0	2.0	<0.05	6.0	<0.6	28.0	<0.7
CR-BC-76	100+20	3.0	<0.8	24.0	33.0	10.0	0.1	22.0	<0.6	83.0	7.5
CR-BC-80	103+12	2.0	<0.8	6.0	6.0	4.0	<0.05	9.0	<0.6	57.0	<0.7
CR-BC-84	104+10	2.0	<0.8	7.0	9.0	5.0	<0.05	10.0	<0.6	60.0	<0.7
CR-BC-85	104+30	2.0	<0.8	6.0	7.0	5.0	<0.05	8.0	<0.6	54.0	<0.7
CR-BC-86	105+25	1.0	<0.8	4.0	7.0	2.0	<0.05	6.0	<0.6	33.0	<0.7
CR-BC-88	106+20	1.0	<0.8	3.0	5.0	2.0	<0.05	6.0	<0.6	31.0	<0.7
Average Value		1.9	<0.8	7.2	8.8	3.4	<0.05	9.7	0.04	43.6	
Maximum Value		3.0	<0.8	24.0	33.0	10.0	0.1	22.0	1.0	85.0	
Screening Levels		57.0	5.10	NA	390.0	450.0	0.41	140.0	6.10	410.0	

Note: The symbol " < " denotes a non-detect at the numerical level listed.

Table 7, CRCD Sediment Evaluation Report

Columbia River- Pesticides and PCBs – ug/kg (ppb)

Site	RM	Aldrin	DDT	DDE	DDD	Total DDT	Aroclor 1254	Aroclor 1260	Total PCBs
CR-BC-05	11+00	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-07	12+45	<2	**3.0**	**0.9**	**0.5**	**4.4**	<10	<10	ND
CR-BC-22	35+10	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-24	39+00	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-25	40+45	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-35	57+20	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-40	63+10	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-41	64+00	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-52	76+50	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-55	82+08	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-56	83+00	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-57	83+34	<2	**0.3**	**0.4**	**0.6**	**1.3**	<10	<10	ND
CR-BC-59	85+20	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-61	86+40	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-73	99+20	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-74	99+20	**0.2**	<2	<2	<2	ND	<10	<10	ND
CR-BC-75	99+20	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-76	100+20	**0.6**	<2	**2.0**	**2.0**	**4.0**	**24.0**	**37.0**	**61.0**
CR-BC-80	103+12	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-84	104+10	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-85	104+30	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-86	105+25	<2	<2	<2	<2	ND	<10	<10	ND
CR-BC-88	106+20	<2	<2	<2	<2	ND	<10	<10	ND
Average Value		0.0	0.1	0.1	0.1	0.4	1.0	1.6	2.7
Maximum Value		0.6	3.0	2.0	2.0	4.4	24.0	37.0	61.0
Screening Levels		10.0				6.9			130.0

Note: The symbol " < " denotes a non-detect at the numerical level listed.

Table 8, CRCD
Sediment Evaluation Report

Columbia River- Low PAHs – ug/kg (ppb)

Site	RM	Napthalene	2-Methyl napthalene	Acenaph-thalene	Acenaph-thene	Fluorene	Phenan-threne	Anthracene	Total Low PAHs
CR-BC-05	11+00	**2.0**	**5.0**	<5	<5	<5	**1.0**	<5	**8.0**
CR-BC-07	12+45	**5.0**	**4.0**	**0.8**	**3.0**	**2.0**	**8.0**	**2.0**	**27.0**
CR-BC-22	35+10	**2.0**	**3.0**	<5	<5	<5	**0.9**	<5	**6.0**
CR-BC-24	39+00	**1.0**	**2.0**	<5	<5	<5	<5	<5	**3.0**
CR-BC-25	40+45	<5	<5	**0.3**	**0.6**	**1.0**	**2.0**	**1.0**	**5.0**
CR-BC-35	57+20	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-40	63+10	**2.0**	**3.0**	**0.5**	**0.7**	**1.0**	**1.0**	**0.7**	**10.0**
CR-BC-41	64+00	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-52	76+50	**1.0**	**2.0**	<5	<5	<5	<5	<5	**3.0**
CR-BC-55	82+08	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-56	83+00	**4.0**	**5.0**	**1.0**	**2.0**	**1.0**	**3.0**	**2.0**	**19.0**
CR-BC-57	83+34	**15.0**	**7.0**	**3.0**	**6.0**	**4.0**	**31.0**	**8.0**	**76.0**
CR-BC-59	85+20	**1.0**	**4.0**	**0.2**	**0.5**	<5	**0.9**	<5	**7.0**
CR-BC-61	86+40	**2.0**	**4.0**	<5	<5	<5	**0.8**	<5	**7.0**
CR-BC-73	99+20	**0.8**	**0.6**	<5	<5	<5	<5	<5	**1.0**
CR-BC-74	99+20	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-75	99+20	**1.0**	**2.0**	<5	<5	<5	<5	<5	**3.0**
CR-BC-76	100+20	**20.0**	**10.0**	**3.0**	**6.0**	**9.0**	**49.0**	**9.0**	**112.0**
CR-BC-80	103+12	**2.0**	**2.0**	<5	**0.5**	**0.7**	**2.0**	**0.8**	**10.0**
CR-BC-84	104+10	**2.0**	**3.0**	<5	<5	<5	**0.9**	<5	**6.0**
CR-BC-85	104+30	**1.0**	**0.7**	<5	<5	**0.6**	**1.0**	**0.7**	**5.0**
CR-BC-86	105+25	**7.0**	**0.6**	<5	<5	<5	<5	<5	**2.0**
CR-BC-88	106+20	**0.7**	**0.6**	<5	<5	**0.7**	**2.0**	**0.8**	**6.0**
Average Value		3.0	2.5	0.4	0.8	0.9	4.5	1.1	13.7
Maximum Value		20.0	10.0	3.0	6.0	9.0	49.0	9.0	112.0
Screening Levels		2,100.0	670.0	560.0	500.0	540.0	1,500.0	960.0	5,200.0

Note: The symbol " < " denotes a non-detect at the numerical level listed.

Table 9, CRCD Sediment Evaluation Report

Columbia River – High PAHs – ug/kg (ppb)

Site	RM	Fluor-anthrene	Pyrene	Benzo-anthracene	Chrysene	Benzo(b,k) fluoranthene	Benzo(a) pyrene	Ideno(1,2,3-cd) pyrene	Dibenz(a,h) anthracene	Benzo(g,h,i) perylene	Total High PAHs
CR-BC-05	11+00	**2.0**	**1.0**	<5	**0.8**	**1.0**	**0.7**	**0.7**	**0.9**	<5	**7.0**
CR-BC-07	12+45	**12.0**	**14.0**	**7.0**	**9.0**	**7.0**	**9.0**	**8.0**	**1.0**	**9.0**	**76.0**
CR-BC-22	35+10	<5	<5	**0.7**	<5	<5	<5	<5	<5	<5	**1.0**
CR-BC-24	39+00	<5	<5	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-25	40+45	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**1.0**	**1.0**	**2.0**	**16.0**
CR-BC-35	57+20	**0.7**	<5	<5	**0.7**	<5	<5	<5	<5	**0.8**	**3.0**
CR-BC-40	63+10	**0.9**	**0.7**	**1.0**	**1.0**	**1.8**	**0.7**	**0.7**	<5	**1.0**	**0.0**
CR-BC-41	64+00	<5	<5	<5	<5	<5	<5	<5	<5	**0.5**	**1.0**
CR-BC-52	76+50	**0.7**	<5	<5	<5	<5	<5	<5	<5	**0.9**	**0.0**
CR-BC-55	82+08	<5	<5	<5	**0.7**	<5	<5	<5	<5	**3.0**	**0.0**
CR-BC-56	83+00	**5.0**	**4.0**	**4.0**	**4.0**	**8.0**	**4.0**	**3.0**	**3.0**	**12.0**	**0.0**
CR-BC-57	83+34	**51.0**	**64.0**	**36.0**	**46.0**	**79.0**	**70.0**	**56.0**	**6.0**	**61.0**	**61.0**
CR-BC-59	85+20	**0.8**	<5	<5	**0.6**	**0.6**	**0.6**	<5	<5	**0.9**	**4.0**
CR-BC-61	86+40	<5	<5	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-73	99+20	<5	<5	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-74	99+20	<5	<5	<5	<5	<5	<5	<5	<5	<5	**0.0**
CR-BC-75	99+20	<5	<5	<5	<5	<5	<5	<5	<5	**1.0**	**1.0**
CR-BC-76	100+20	**87.0**	**77.0**	**38.0**	**50.0**	**67.0**	**37.0**	**20.0**	**4.0**	**27.0**	**407.0**
CR-BC-80	103+12	**2.0**	<5	<5	**0.6**	<5	<5	<5	<5	<5	**3.0**
CR-BC-84	104+10	**1.0**	**2.0**	**0.8**	**0.9**	**1.4**	**1.0**	**1.0**	<5	**1.0**	**9.0**
CR-BC-85	104+30	**2.0**	<5	**2.0**	**2.0**	**6.0**	**2.0**	**2.0**	**1.0**	**2.0**	**19.0**
CR-BC-86	105+25	<5	<5	<5	<5	<5	<5	<5	<5	**2.0**	**2.0**
CR-BC-88	106+20	**2.0**	<5	**2.0**	**2.0**	**5.0**	**2.0**	**2.0**	**1.0**	**5.0**	**21.0**
Average Value		7.4	7.2	4.1	5.2	7.8	5.6	4.1	0.8	5.6	27.4
Maximum Value		87.0	77.0	38.0	50.0	79.0	70.0	56.0	6.0	61.0	407.0
Screening Levels		1,700.0	2,600.0	1,300.0	1,400.0	3,200.0	1,600.0	600.0	230.0	670.0	12,000

Note: The symbol " < " denotes a non-detect at the numerical level listed.

Table 10, CRCD Sediment Evaluation Report

Columbia River- P450 RGS (Dioxin/Furan Screen)

Site	RM	6 Hour B(a)P Eq (ug/g)	TEQ (ng/g)	16 Hour B(a)P Eq (ug/g)	TEQ (ng/g)	Ratio	Primary* Contaminates
CR-BC-05	11+00	1.90	0.10	0.50	0.03	4	both
CR-BC-07	12+45	3.00	0.20	2.40	0.10	1	both
CR-BC-22	35+10	1.10	0.10	0.20	0.01	7	PAHs
CR-BC-24	39+00	0.50	0.03	0.10	0.01	4	both
CR-BC-25	40+45	0.70	0.04	0.10	0.01	9	PAHs
CR-BC-35	57+20	1.40	0.10	0.10	0.01	10	PAHs
CR-BC-40	63+10	0.70	0.02	0.10	0.01	4	both
CR-BC-41	64+00	0.70	0.04	0.20	0.01	5	both
CR-BC-52	76+50	0.70	0.04	0.10	0.01	7	PAHs
CR-BC-55	82+08	0.70	0.04	0.10	0.01	5	both
CR-BC-56	83+00	0.60	0.04	0.20	0.01	3	both
CR-BC-57	83+34	3.60	0.20	3.70	0.20	1	both
CR-BC-59	85+20	0.50	0.03	0.10	0.01	6	PAHs
CR-BC-61	86+40	1.00	0.10	0.10	0.01	12	PAHs
CR-BC-73	99+20	1.70	0.10	0.10	0.01	14	PAHs
CR-BC-74	99+20	1.40	0.10	0.20	0.01	7	PAHs
CR-BC-75	99+20	2.70	0.20	0.40	0.03	6	PAHs
CR-BC-76**	100+20	3.90	0.20	8.50	0.50	0.5	PCBs/dioxins
CR-BC-80	103+12	5.50	0.30	0.90	0.10	6	PAHs
CR-BC-84	104+10	4.20	0.30	1.00	0.10	4	both
CR-BC-85	104+30	4.70	0.30	1.40	0.10	3	both
CR-BC-86	105+25	0.30	0.02	0.10	0.01	3	both
CR-BC-88	106+20	0.60	0.03	0.10	0.01	7	PAHs

*Based on ratio of 6hr/16 hr where ratio > 5 = PAHs; ratio 5 to 1 = both PAHs and chlorinated compounds; and ratio < 1 = chlorinated compounds.

** See text page 7- P-450.

Note: The term "both" indicates that PAHs and Chlorinated Compounds have been detected; if the corresponding sample analysis show PAHs & PCBs present in significant amounts, it is not likely that Dioxins are present in that sample.

ug B(a)P Eq = PAHs detected by P450 RGS.
TEQ = Chlorinated hydrocarbons detected by P450 RGS.

Table 11, CRCD, Sampled July 22-25, 1997 Willamette River – Physical Analysis

Site	Depth Sediment Sample	*Water Depth	RM	Mean mm	Median mm	Sand %finer	vfsand %finer	Silt	Clay	%fines	Vol Solids %	Solids %	TOC %
WR-BC-01	8 inches	43.6	0.10	0.47	0.30	41.7	13.1	5.2	0.0	5.2	0.8	75.1	0.13
WR-A	8 inches	43.6	0.10	0.65	0.28	45.2	17.4	7.4	0.0	7.4	0.9	73.0	0.16
WR-GC-02A	0-6.0 feet	41.9	0.10	0.16	0.15	81.8	39.7	21.2	1.8	23.0	1.4	69.1	0.59
WR-GC-02B	6.0-9.9 feet		0.10	0.49	0.30	41.9	9.3	2.4	0.0	2.4	0.7	77.0	0.14
WR-BC-03	8 inches	43.7	0.40	0.24	0.21	62.2	20.1	7.2	0.0	7.2	1.8	66.6	0.38
WR-GC-04A	0-6.0 feet	24.4	0.80	0.08	0.06	91.0	79.2	51.2	3.8	55.0	3.0	63.7	0.99
WR-GC-04B	6.0-7.0 feet		0.80	0.06	0.03	95.0	87.4	73.0	5.6	78.6	3.6	62.3	0.92
WR-GC-04Z	7.0-7.6 feet		0.80	0.07	0.05	92.1	80.8	60.6	4.2	64.8	3.0		
WR-GC-05A	0-6.0 feet	39.0	0.80	0.05	0.03	96.9	89.0	74.9	7.5	82.4	3.6	66.7	0.99
WR-GC-05B	6.0-7.0 feet		0.80	0.03	0.02	98.1	95.6	91.6	8.9	100.5	3.6	68.6	0.88
WR-GC-06A	0-6.0 feet	42.5	0.95	0.05	0.03	97.8	92.7	71.8	2.6	74.4	2.6	55.0	0.26
WR-GC-06B	6.0-9.0 feet		0.95	0.05	0.03	99.4	94.1	71.6	7.2	78.8	2.5	53.4	0.06
WR-GC-06Z	9.0-10.5 feet		0.95	0.02	0.02	99.3	98.9	93.9	3.1	97.0	2.5		
WR-BC-07	9.5 inches	29.8	1.60	0.04	0.04	98.4	93.5	75.3	4.7	80.0	4.2	51.5	1.33
WR-BC-08	10 inches	45.9	1.70	0.07	0.04	93.3	83.6	68.5	3.4	71.9	3.6	54.2	1.20
WR-BC-09	10 inches	43.7	2.05	0.06	0.04	97.7	84.2	69.1	5.5	74.6	3.9	53.9	1.26
WR-BC-10	9.5 inches	43.1	2.45	0.07	0.04	89.8	80.4	67.3	4.9	72.2	4.9	47.1	1.59
WR-B	9.5 inches	43.1	2.45	0.13	0.04	89.6	79.6	65.2	5.7	70.9	5.0	48.9	1.84
WR-GC-11A	0-6.0 feet	44.3	2.90	0.08	0.06	92.3	73.9	52.1	4.1	56.2	4.7	55.2	1.62
WR-GC-11Z	6.0-11.0 feet		2.90	0.04	0.03	98.5	92.6	81.3	6.6	87.9	4.1		
WR-BC-12,13,14	9, 10, 8.5 inch	46,44,44	3.40	0.19	0.13	65.6	48.6	38.2	5.7	43.9	3.5	70.1	0.37
WR-BC-15	9.5 inches	43.3	3.80	0.07	0.04	92.0	80.2	72.1	6.9	79.0	5.3	46.2	1.78
WR-BC-16,17	9, 9 inches	42.3,42.4	4.10	0.27	0.30	33.4	20.9	19.1	2.1	21.2	1.4	57.9	0.54
WR-GC-18A	0-6.0 feet	38.2	5.10	0.05	0.04	95.9	89.1	73.4	6.7	80.1	7.0	52.6	2.26
WR-GC-18Z	6.0-8.6 feet		5.10	0.08	0.05	89.7	78.0	62.9	4.6	67.5	7.0		
WR-GC-19A	0-6.0 feet	80.0	5.10	0.36	0.35	15.6	0.9	0.4	0.0	0.4	1.2	77.9	0.07
WR-BC-20	9.5 inches	46.3	5.15	0.47	0.42	10.8	7.9	5.9	0.0	5.9	2.2	72.7	0.38
WR-BC-21	8.5 inches	46.0	5.90	0.48	0.42	4.7	2.5	1.9	0.0	1.9	1.4	76.6	0.61
WR-BC-22	9 inches	43.5	6.20	0.60	0.50	4.4	0.9	0.5	0.0	0.5	2.3	82.2	0.77
WR-BC-23	7 inches	43.6	6.50	0.42	0.39	7.0	1.4	0.6	0.0	0.6	1.1	77.8	0.52
WR-GC-24A	0-6.0 feet	45.0	6.70	1.24	0.09	84.5	61.8	38.4	3.7	42.1	4.2	60.9	1.91
WR-GC-24B	6.0-7.0 feet		6.70	9.20	0.30	46.0	23.8	9.1	1.4	10.5	1.4	81.4	1.85
WR-GC-24Z	7.0-7.7 feet		6.70	10.01	1.57	9.5	4.7	2.7	0.0	2.7	0.9		
WR-GC-25A	0-2.0 feet	44.2	6.70	0.03	0.03	94.7	92.9	85.3	7.9	93.2	6.3	54.8	2.08
WR-GC-25Z	2.0-4.4 feet		6.70	0.36	0.35	13.7	5.4	3.4	0.0	3.4	1.5		
WR-BC-26,27,28	9, 7.5, 10 inch	44,47,44	6.90	0.30	0.32	28.2	18.6	11.6	0.0	11.6	2.5	70.6	0.18
WR-BC-29	10 inches	44.9	7.50	0.17	0.09	67.3	57.0	42.0	2.4	44.4	3.9	58.4	1.18
WR-C	10 inches	44.9	7.50	0.16	0.09	69.9	59.5	39.9	2.9	42.8	4.1	58.4	1.32
WR-GC-30A	0-5.0 feet	41.6	8.50	0.07	0.06	95.6	80.8	51.1	6.3	57.4	4.7	57.3	1.80
WR-GC-30Z	5.0-9.7 feet		8.50	0.09	0.06	94.2	70.3	49.8	7.5	57.3	5.8		
WR-GC-31A	0-5.0 feet	41.5	8.90	0.10	0.09	95.7	66.5	38.5	5.5	44.0	4.9	61.2	1.68
WR-GC-31Z	5.0-6.0 feet		8.90	0.06	0.05	96.0	85.9	59.3	7.8	67.1	5.3		
WR-GC-32A	0-6.0 feet	41.0	10.00	0.08	0.05	93.4	76.8	52.7	7.2	59.9	5.1	60.5	1.66
WR-GC-32Z	6.0-7.3 feet		10.00	0.03	0.03	98.2	96.5	90.6	11.4	102.0	3.1		
WR-GC-33A	0-5.0 feet	43.1	10.10	0.08	0.06	94.3	77.6	54.7	4.5	59.2	5.0	59.7	1.64
WR-GC-33Z	5.0-7.4 feet		10.10	0.04	0.04	99.4	98.5	85.9	5.5	91.4	3.5		
WR-GC-34A	0-5.0 feet	46.2	10.00	0.21	0.15	64.4	46.4	31.8	4.1	35.9	4.7	61.9	1.96
WR-GC-35A	0-5.0 feet	42.7	10.10	0.11	0.05	85.1	70.3	59.3	7.8	67.1	6.9	55.8	2.33
WR-GC-35Z	5.0-8.9 feet		10.10	0.05	0.04	95.9	90.1	74.1	7.3	81.4	8.6		
WR-BC-36	9.7 inches	45.4	10.30	0.21	0.19	59.4	38.1	27.9	4.0	31.9	3.8	59.8	1.43
WR-GC-37A	0-4.0 feet	45.4	11.10	0.59	0.53	3.1	0.3	0.1	0.0	0.1	0.9	81.3	0.07
WR-GC-38A	0-2.0 feet	42.5	11.20	0.59	0.55	4.2	1.1	0.7	0.0	0.7	1.2	71.2	1.04
WR-GC-38Z	2.0-4.1 feet		11.20	0.76	0.58	2.8	0.3	0.1	0.0	0.1	0.9		
WR-GC-39A	0-4.0 feet	40.0	11.65	1.07	0.48	6.3	0.7	0.4	0.0	0.4	1.3	78.1	0.77
WR-GC-39Z	4.0-5.0 feet		11.65	0.59	0.57	1.9	0.3	0.2	0.0	0.2	0.8		
WR-CD-40A	0-2.0 feet	45.6	11.30	0.72	0.62	2.6	0.4	0.2	0.0	0.2	1.1	82.0	0.30
WR-CD-40Z	2.0-3.5 feet	38.3	11.30	1.71	0.74	1.6	0.2	0.1	0.0	0.1	1.0		
WR-CD-41A	0-6.0 feet	38.3	11.35	0.35	0.34	15.3	3.3	1.4	0.0	1.4	1.4	73.2	0.44
WR-CD-41B	6.0-7.0 feet		11.35	0.18	0.15	66.6	45.5	38.4	3.6	42.0	5.2	60.2	2.74
WR-CD-41Z	7.0-8.8 feet		11.35	1.01	0.25	50.6	24.5	15.4	2.2	17.6	7.1		
WR-CD-42A	0-6.0 feet	24.7	11.50	0.12	0.10	92.0	59.0	39.6	2.6	42.2	4.7	59.5	1.51
WR-CD-42B	6.0-12.0 feet		11.50	0.11	0.08	89.3	58.4	45.7	5.9	51.6	4.5	92.8	1.44
WR-CD-42C	12.0-18.0 feet		11.50	0.15	0.14	78.6	45.9	36.0	4.5	40.5	5.5	62.6	1.98
WR-CD-42D	18.0-20.0 feet		11.50	0.18	0.16	68.5	42.9	34.6	3.9	38.5	5.5	63.8	2.09
WR-CD-43A	0-6.0 feet	48	11.55	0.48	0.39	11.3	0.7	0.2	0.0	0.2	1.5	86.5	0.38
WR-D	0-6.0 feet		11.55	0.48	0.39	13.0	0.9	0.5	0.0	0.5	1.3	89.2	1.21
WR-CD-43B	6.0-12.0 feet		11.55	3.71	0.63	5.3	0.3	0.2	0.0	0.2	1.2	89.7	0.10
WR-CD-43Z	12.0-14.0 feet		11.55	4.45	1.12	4.7	0.3	0.1	0.0	0.1	1.1		

Note: The following are field replicate pairs: WR-BC-01, WR-A; WR-BC-10, WR-B; WR-BC-29, WR-C; WR-BC-43A, WR-D.
*Water depth in feet corrected to Columbia River Datum .

Table 12, CRCD Sediment Evaluation Report

Willamette River – Metals Analysis

Site	Date	RM	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Silver	Zinc	TBT	AVS
						mg/kg (ppm)						ppb	%
WR-BC-01	24-Jul-97	0.10	1.0	0.19	10.5	8.0	5.0	0.03	9.0	0.04	51.0	<0.05	<0.7
WR-A	24-Jul-97	0.10	1.2	0.21	11.9	8.8	5.3	0.02	9.4	0.05	52.6	<0.05	<0.7
WR-GC-02A	24-Jul-97	0.10	2.4	0.50	15.9	13.2	10.1	0.06	12.8	0.08	92.1		19.0
WR-GC-02B	24-Jul-97	0.10	1.1	0.10	12.2	8.9	3.4	0.04	9.2	0.04	34.5		0.8
WR-BC-03	24-Jul-97	0.40	2.7	0.33	17.8	16.3	10.5	0.03	16.7	0.11	89.5	<0.05	<0.8
WR-GC-04A	24-Jul-97	0.80	5.8	1.36	26.8	24.0	27.0	0.13	18.1	0.18	166.0		53.0
WR-GC-04B	24-Jul-97	0.80	5.6	1.62	24.3	26.4	23.7	0.12	17.8	0.15	138.0		30.0
WR-GC-05A	24-Jul-97	0.80	3.2	0.23	25.2	24.6	9.1	0.07	19.8	0.14	61.2		4.8
WR-GC-05B	24-Jul-97	0.80	0.6	0.16	24.9	24.5	7.1	0.03	19.3	0.16	53.6		4.8
WR-GC-06A	24-Jul-97	0.95	1.3	0.13	11.4	14.5	3.7	0.03	9.3	0.08	30.4		0.8
WR-GC-06B	24-Jul-97	0.95	1.3	0.03	6.6	9.4	1.2	0.01	4.4	0.03	10.8		1.9
WR-BC-07	24-Jul-97	1.60	0.6	0.93	27.6	30.4	19.6	0.08	19.7	0.21	139.0	<0.05	65.0
WR-BC-08	24-Jul-97	1.70	2.5	0.65	28.9	28.2	15.9	0.06	20.9	0.16	115.0	<0.05	14.8
WR-BC-09	24-Jul-97	2.05	3.5	0.54	28.4	27.2	14.8	0.06	19.7	0.16	101.0	<0.05	2.9
WR-BC-10	24-Jul-97	2.45	4.0	0.71	33.0	36.7	20.7	0.09	22.5	0.28	137.0	0.10	47.0
WR-B	24-Jul-97	2.45	3.5	0.67	26.8	33.0	19.7	0.08	19.7	0.25	128.0	0.10	47.0
WR-GC-11A	24-Jul-97	2.90	2.5	0.43	28.1	31.6	22.0	0.09	21.7	0.25	120.0		10.2
WR-BC-12, 13, 14	24-Jul-97	3.40	2.6	0.22	20.4	20.8	11.6	0.07	17.4	0.10	79.1	<0.05	4.6
WR-BC-15	24-Jul-97	3.80	2.8	0.41	33.2	39.0	21.2	0.08	23.7	0.31	131.0	0.14	17.5
WR-BC-16,17	24-Jul-97	4.10	3.5	0.16	21.3	20.9	9.2	0.17	19.7	0.10	76.5	<0.05	2.2
WR-GC-18A	22-Jul-97	5.10	4.5	0.27	32.5	36.7	25.3	0.08	23.5	0.27	112.0		17.9
WR-GC-19A	22-Jul-97	5.10	1.4	0.05	15.1	13.5	2.8	0.03	19.2	0.06	41.6		<0.7
WR-BC-20	24-Jul-97	5.15	2.1	0.09	16.7	15.2	9.0	0.11	14.0	0.07	54.9	<0.05	0.9
WR-BC-21	24-Jul-97	5.90	2.7	0.06	17.0	16.4	4.5	0.02	16.0	0.06	53.6	**0.25**	<0.7
WR-BC-22	24-Jul-97	6.20	3.3	0.05	14.5	12.2	4.7	0.01	14.8	0.06	45.2		3.6
WR-BC-23	24-Jul-97	6.50	1.4	0.05	15.8	13.1	3.9	0.03	14.7	0.06	49.3	**0.42**	<0.7
WR-GC-24A	22-Jul-97	6.70	2.1	0.20	20.4	25.3	14.8	0.17	22.9	0.21	85.5		34.0
WR-GC-24B	22-Jul-97	6.70	2.4	0.09	12.5	15.7	3.6	0.02	20.6	0.06	39.6		<0.7
WR-GC-25A	24-Jul-97	6.70	3.7	0.33	30.7	36.3	27.7	0.18	22.2	0.35	150.0		19.0
WR-BC-26, 27, 28	24-Jul-97	6.90	2.1	0.08	17.7	16.4	5.9	0.03	16.1	0.08	51.5	0.01	0.8
WR-BC-29	24-Jul-97	7.50	3.9	0.17	25.0	26.9	16.8	0.08	20.8	0.18	110.0	0.02	11.4
WR-C	24-Jul-97	7.50	2.7	0.17	27.9	27.6	17.5	0.06	21.2	0.19	107.0	0.02	1.5
WR-GC-30A	22-Jul-97	8.50	2.8	0.22	32.1	32.3	22.8	0.07	23.4	0.28	131.0		23.0
WR-GC-31A	22-Jul-97	8.90	0.6	0.18	26.9	26.8	26.0	0.06	21.7	0.21	80.6		11.8
WR-GC-32A	22-Jul-97	10.00	3.3	0.19	28.7	31.5	22.9	0.07	22.6	0.24	99.2		13.0
WR-GC-33A	22-Jul-97	10.10	<0.5	0.29	30.4	33.0	38.7	0.09	22.8	0.33	161.0		46.0
WR-GC-34A	23-Jul-97	10.00	2.0	0.23	29.4	35.9	17.7	0.19	19.8	0.29	108.0		17.0
WR-GC-35A	23-Jul-97	10.10	<0.5	0.33	34.5	35.9	25.7	0.18	21.2	0.38	181.0		37.0
WR-BC-36	24-Jul-97	10.30	2.1	0.30	26.2	27.7	32.2	0.09	20.0	0.27	171.0	<0.05	22.0
WR-GC-37A	23-Jul-97	11.10	<0.5	0.05	13.9	11.0	3.5	0.01	10.4	0.03	37.5		<2.0
WR-GC-38A	23-Jul-97	11.20	<0.5	0.17	22.8	21.3	9.1	0.10	14.5	0.14	74.5		0.6
WR-GC-39A	23-Jul-97	11.65	2.3	0.09	17.3	15.4	5.7	0.04	12.7	0.07	190.0		0.8
WR-CD-40A	23-Jul-97	11.30	0.5	0.04	15.1	11.9	2.2	0.01	11.0	0.03	29.4		<0.7
WR-CD-41A	23-Jul-97	11.35	<0.5	0.11	22.2	17.4	26.1	0.03	17.1	0.12	80.6		2.9
WR-CD-41B	23-Jul-97	11.35	<0.5	0.06	32.7	36.4	18.5	0.09	21.0	0.34	103.0		17.9
WR-CD-42A	23-Jul-97	11.50	<0.5	0.27	35.4	30.4	26.9	0.08	23.5	0.41	102.0		11.9
WR-CD-42B	23-Jul-97	11.50	<0.5	0.19	19.0	20.9	19.9	0.08	14.2	0.25	131.0		26.0
WR-CD-42C	23-Jul-97	11.50	0.7	0.30	29.2	30.4	26.6	**0.87**	19.6	0.41	179.0		42.0
WR-CD-42D	23-Jul-97	11.50	<0.5	0.31	32.3	30.8	26.0	0.34	21.3	0.35	160.0		24.0
WR-CD-43A	23-Jul-97	11.55	19.7	2.12	17.2	70.1	**489.0**	0.03	13.8	0.12	102.0		2.9
WR-D	23-Jul-97	11.55	<0.5	0.11	19.6	18.0	64.3	0.03	14.3	0.06	55.6		42.0
WR-CD-43B	23-Jul-97	11.55	<0.5	0.07	14.4	14.4	15.0	0.10	11.9	0.05	45.9		0.9
Average Level			2.3	0.32	22.7	24.1	41.1	0.09	17.6	0.17	94.8	0.02	14.6
Maximum Level			19.7	2.12	35.4	70.1	489.0	0.87	23.7	0.41	190.0	0.42	65.0
Screening Levels			57.0	5.10	NA	390.0	450.0	0.41	140.0	6.10	410.0	0.15	

Note: The symbol "< " denotes a non-detect at the numerical level listed.

Willamette River – Pesticides/PCBs – ug/kg (ppb)

Site	Date	RM	Dieldrin	DDT	DDE	DDD	Total DDT	Chlordane	Aroclor 1242	Aroclor 1254	Aroclor 1260	Total PCBS
WR-BC-01	24-Jul-97	0.10	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-A	24-Jul-97	0.10	<2.0	<2.0	<2.0	0.2	0.2	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-02A	24-Jul-97	0.10	<2.0	<2.0	0.7	1.0	1.7	<10.0	<10.0	<10.0	5.0	5.0
WR-GC-02B	24-Jul-97	0.10	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-BC-03	24-Jul-97	0.40	<5.0	<2.0	0.4	0.7	1.1	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-04A	24-Jul-97	0.80	<2.0	<2.0	7.0	5.0	*12.0*	<10.0	29.0	43.0	<10.0	72.0
WR-GC-04B	24-Jul-97	0.80	<2.0	<2.0	4.0	7.0	*11.0*	<10.0	<10.0	<10.0	7.0	7.0
WR-GC-05A	24-Jul-97	0.80	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-05B	24-Jul-97	0.80	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-06A	24-Jul-97	0.95	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-06B	24-Jul-97	0.95	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-BC-07	24-Jul-97	1.60	<2.0	<2.0	2.0	1.0	3.0	<10.0	<10.0	<10.0	7.0	7.0
WR-BC-08	24-Jul-97	1.70	<2.0	<2.0	2.0	1.0	3.0	<10.0	<10.0	<10.0	5.0	5.0
WR-BC-09	24-Jul-97	2.05	<2.0	0.3	1.0	1.0	2.3	<10.0	<10.0	<10.0	4.0	4.0
WR-BC-10	24-Jul-97	2.45	<2.0	0.3	2.0	2.0	4.3	<10.0	<10.0	<10.0	11.0	11.0
WR-B	24-Jul-97	2.45	<2.0	<2.0	2.0	2.0	4.0	<10.0	<10.0	<10.0	9.0	9.0
WR-GC-11A	24-Jul-97	2.90	<2.0	<2.0	2.0	2.0	4.0	<10.0	7.0	<10.0	21.0	28.0
WR-BC-12,13,14	24-Jul-97	3.40	<2.0	0.2	0.7	2.0	2.9	<10.0	<10.0	<10.0	5.0	5.0
WR-BC-15	24-Jul-97	3.80	<2.0	1.0	1.0	1.0	3.0	<10.0	<10.0	<10.0	9.0	9.0
WR-BC-16,17	24-Jul-97	4.10	<2.0	1.0	1.0	1.0	3.0	<10.0	<10.0	<10.0	4.0	4.0
WR-GC-18A	22-Jul-97	5.10	<2.0	0.8	2.0	2.0	4.8	<10.0	<10.0	<10.0	19.0	19.0
WR-GC-19A	22-Jul-97	5.10	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-BC-20	24-Jul-97	5.15	<2.0	2.0	0.7	2.0	4.7	<10.0	<10.0	<10.0	4.0	4.0
WR-BC-21	24-Jul-97	5.90	<2.0	14.0	<2.0	3.3	*17.3*	<10.0	<10.0	<10.0	<10.0	0.0
WR-BC-22	24-Jul-97	6.20	<2.0	1.7	<2.0	<2.0	1.7	<10.0	<10.0	<10.0	<10.0	0.0
WR-BC-23	24-Jul-97	6.50	<2.0	1.7	<2.0	<2.0	*1.7*	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-24A	22-Jul-97	6.70	<2.0	94.0	4.0	100.0	*198.0*	<10.0	<10.0	<30.0	21.0	21.0
WR-GC-24B	22-Jul-97	6.70	<2.0	2.0	<2.0	0.2	2.2	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-25A	24-Jul-97	6.70	<2.0	<2.0	3.0	4.0	*7.0*	<10.0	26.0	<10.0	52.0	78.0
WR-BC-26,27,28	24-Jul-97	6.90	<2.0	1.9	0.7	1.3	3.9	<10.0	<10.0	<10.0	<10.0	0.0
WR-BC-29	24-Jul-97	7.50	0.4	2.1	3.0	2.4	*7.5*	<10.0	6.0	27.0	30.0	63.0
WR-C	24-Jul-97	7.50	<2.0	3.4	2.2	2.2	*7.8*	<10.0	5.0	22.0	70.0	97.0
WR-GC-30A	22-Jul-97	8.50	<2.0	0.8	1.0	1.0	2.8	<10.0	<10.0	<2.00	22.0	22.0
WR-GC-31A	22-Jul-97	8.90	<2.0	0.5	1.0	0.8	2.3	<10.0	<10.0	<10.0	9.0	9.0
WR-GC-32A	22-Jul-97	10.00	<2.0	4.0	1.0	0.7	5.7	<10.0	<10.0	<10.0	9.0	9.0
WR-GC-33A	22-Jul-97	10.10	<2.0	0.3	2.0	1.0	3.3	<10.0	<10.0	<30.0	43.0	43.0
WR-GC-34A	23-Jul-97	10.00	<2.0	<2.0	2.0	2.0	4.0	<10.0	<10.0	14.0	23.0	37.0
WR-GC-35A	23-Jul-97	10.10	0.4	<2.0	4.0	4.0	*5.0*	<10.0	<10.0	44.0	42.0	86.0
WR-BC-36	24-Jul-97	10.30	<2.0	0.9	2.5	1.4	4.8	<10.0	12.0	44.0	49.0	105.0
WR-GC-37A	23-Jul-97	11.10	<2.0	0.2	<2.0	0.4	0.6	<10.0	<10.0	4.0	6.0	10.0
WR-GC-38A	23-Jul-97	11.20	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-GC-39A	23-Jul-97	11.65	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-CD-40A	23-Jul-97	11.30	*13.0*	<2.0	4.0	19.0	*23.0*	*47.0*	<10.0	46.0	15.0	61.0
WR-CD-41A	23-Jul-97	11.35	<2.0	<2.0	0.5	0.4	0.9	<10.0	<10.0	6.0	6.0	12.0
WR-CD-41B	23-Jul-97	11.35	<2.0	1.0	1.0	<2.0	2.0	<10.0	<10.0	11.0	16.0	27.0
WR-CD-42A	23-Jul-97	11.50	<2.0	<2.0	1.0	0.8	1.8	<10.0	<10.0	11.0	12.0	23.0
WR-CD-42B	23-Jul-97	11.50	2.0	0.6	0.5	2.0	3.1	<10.0	<10.0	26.0	31.0	57.0
WR-CD-42C	23-Jul-97	11.50	<2.0	<2.0	2.0	0.8	2.8	<10.0	<10.0	24.0	21.0	45.0
WR-CD-42D	23-Jul-97	11.50	<2.0	<2.0	2.0	3.0	5.0	<10.0	<10.0	90.0	156.0	*246.0*
WR-CD-43A	23-Jul-97	11.55	<2.0	2.0	<2.0	1.0	3.0	<10.0	<10.0	<10.0	<10.0	0.0
WR-D	23-Jul-97	11.55	<2.0	<2.0	<2.0	0.3	0.3	<10.0	<10.0	<10.0	<10.0	0.0
WR-CD-43B	23-Jul-97	11.55	<2.0	<2.0	<2.0	<2.0	0.0	<10.0	<10.0	<10.0	<10.0	0.0
Average Value			0.3	2.6	1.3	3.5	7.4	0.9	1.6	7.8	14.3	0.06
Maximum Value			13.0	94.0	7.0	100.0	198.0	47.0	29.0	90.0	156.0	246.0
Screening Levels			10.0				6.9	10.0				130

Note: The symbol "< " denotes a non-detect at the numerical level listed.

Table 14, CRCD Sediment Evaluation Report

Willamette River – Low PAHs – ug/kg (ppb)

Site	Date	RM	Napthalene	2-Methyl naphthalene	Ace naphthylene	Ace naphthene	Fluorene	Phenanthrene	Anthracene	Total Low PAHs
WR-BC-01	24-Jul-97	0.10	1.0	1.0	2.0	1.0	0.7	5.0	1.0	
WR-A	24-Jul-97	0.10	1.0	2.0	1.0	0.9	1.0	4.0	1.0	10.9
WR-GC-02A	24-Jul-97	0.10	4.0	4.0	5.0	3.0	3.0	20.0	6.0	45.0
WR-GC-02B	24-Jul-97	0.10	1.0	2.0	0.7	0.9	1.0	4.0	1.0	10.6
WR-BC-03	24-Jul-97	0.40	2.0	3.0	0.5	<5.0	0.9	5.0	1.0	12.4
WR-GC-04A	24-Jul-97	0.80	31.0	27.0	11.0	16.0	19.0	96.0	27.0	227.0
WR-GC-04B	24-Jul-97	0.80	24.0	12.0	4.0	7.0	10.0	65.0	18.0	140.0
WR-GC-05A	24-Jul-97	0.80	3.0	2.0	1.0	1.0	2.0	10.0	2.0	21.0
WR-GC-05B	24-Jul-97	0.80	0.6	2.0	0.3	<5.0	0.8	3.0	<5.0	6.7
WR-GC-06A	24-Jul-97	0.95	1.0	2.0	0.6	0.7	0.7	3.0	0.6	8.6
WR-GC-06B	24-Jul-97	0.95	2.0	2.0	1.0	1.0	2.0	2.0	3.0	13.0
WR-BC-07	24-Jul-97	1.60	8.0	6.0	5.0	6.0	6.0	38.0	11.0	80.0
WR-BC-08	24-Jul-97	1.70	2.0	3.0	3.0	2.0	3.0	14.0	6.0	33.0
WR-BC-09	24-Jul-97	2.05	23.0	13.0	10.0	9.0	9.0	66.0	17.0	147.0
WR-BC-10	24-Jul-97	2.45	23.0	22.0	25.0	14.0	16.0	120.0	36.0	256.0
WR-B	24-Jul-97	2.45	19.0	21.0	14.0	11.0	14.0	105.0	29.0	213.0
WR-GC-11A	24-Jul-97	2.90	221.0	130.0	62.0	122.0	105.0	684.0	160.0	1,484.0
WR-BC-12, 13, 14	24-Jul-97	3.40	35.0	22.0	13.0	18.0	15.0	136.0	31.0	270.0
WR-BC-15	24-Jul-97	3.80	98.0	50.0	107.0	112.0	77.0	495.0	161.0	1,100.0
WR-BC-16,17	24-Jul-97	4.10	22.0	12.0	95.0	30.0	29.0	460.0	135.0	783.0
WR-GC-18A	22-Jul-97	5.10	230.0	170.0	10.0	148.0	133.0	331.0	61.0	1,083.0
WR-GC-19A	22-Jul-97	5.10	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0.0
WR-BC-20	24-Jul-97	5.15	280.0	135.0	406.0	1,700.0	940.0	8,200.0	4,400.0	16,061.0
WR-BC-21	24-Jul-97	5.90	7.0	2.0	14.0	145.0	61.0	1,900.0	189.0	2,318.0
WR-BC-22	24-Jul-97	6.20	5,300.0	1,700.0	8,500.0	79,000.0	44,000.0	180,000.0	77,000.0	395,500.0
WR-BC-23	24-Jul-97	6.50	0.5	1.0	<5.0	<5.0	<5.0	1.0	<5.0	2.5
WR-GC-24A	22-Jul-97	6.70	129.0	82.0	27.0	104.0	77.0	540.0	111.0	1,070.0
WR-GC-24B	22-Jul-97	6.70	0.6	0.6	0.2	<5.0.0	<5.0.0	<5.0.0	<5.0.0	1.4
WR-GC-25A	24-Jul-97	6.70	64.0	44.0	25.0	129.0	102.0	356.0	64.0	784.0
WR-BC-26, 27, 28	24-Jul-97	6.90	1.0	1.0	0.7	<5.0.0	0.5	4.0	0.8	8.0
WR-BC-29	24-Jul-97	7.50	22.0	69.0	4.0	8.0	9.0	50.0	13.0	175.0
WR-C	24-Jul-97	7.50	11.0	38.0	6.0	10.0	9.0	47.0	13.0	134.0
WR-GC-30A	22-Jul-97	8.50	19.0	39.0	7.0	8.0	11.0	68.0	17.0	169.0
WR-GC-31A	22-Jul-97	8.90	16.0	8.0	5.0	5.0	7.0	44.0	9.0	94.0
WR-GC-32A	22-Jul-97	10.00	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0.0
WR-GC-33A	22-Jul-97	10.10	24.0	42.0	7.0	9.0	14.0	73.0	15.0	184.0
WR-GC-34A	23-Jul-97	10.00	55.0	24.0	66.0	21.0	13.0	124.0	42.0	345.0
WR-GC-35A	23-Jul-97	10.10	32.0	25.0	6.0	10.0	10.0	82.0	19.0	184.0
WR-BC-36	24-Jul-97	10.30	41.0	18.0	6.0	16.0	15.0	81.0	21.0	198.0
WR-GC-37A	23-Jul-97	11.10	0.5	<5.0	<5.0	<5.0	<5.0	0.9	<5.0	1.4
WR-GC-38A	23-Jul-97	11.20	9.0	3.0	8.0	19.0	8.0	88.0	23.0	158.0
WR-GC-39A	23-Jul-97	11.65	3.0	1.0	4.0	10.0	3.0	42.0	12.0	75.0
WR-CD-40A	23-Jul-97	11.30	0.4	0.6	<5.0	<5.0	<5.0	1.0	<5.0	2.0
WR-CD-41A	23-Jul-97	11.35	5.0	3.0	4.0	5.0	4.0	27.0	12.0	60.0
WR-CD-41B	23-Jul-97	11.35	26.0	15.0	14.0	59.0	41.0	226.0	52.0	433.0
WR-CD-42A	23-Jul-97	11.50	26.0	11.0	9.0	5.0	6.0	45.0	10.0	112.0
WR-CD-42B	23-Jul-97	11.50	11.0	11.0	4.0	6.0	9.0	51.0	13.0	105.0
WR-CD-42C	23-Jul-97	11.50	23.0	24.0	6.0	11.0	11.0	74.0	20.0	169.0
WR-CD-42D	23-Jul-97	11.50	44.0	22.0	7.0	14.0	15.0	90.0	19.0	211.0
WR-CD-43A	23-Jul-97	11.55	25.0	5.0	4.0	10.0	6.0	35.0	13.0	98.0
WR-D	23-Jul-97	11.55	212.0	20.0	32.0	93.0	50.0	208.0	56.0	671.0
WR-CD-43B	23-Jul-97	11.55	4.0	2.0	3.0	4.0	2.0	10.0	5.0	30.0
Average Value			137.4	54.9	183.6	1,575.1	882.1	3,752.6	1,593.4	
Maximum Value			5,300.0	1,700.0	8,500.0	79,000.0	44,000.0	180,000.0	77,000.0	395,500.0
Screening Levels			2,100.0	670.0	560.0	500.0	540.0	1,500.0	960.0	5,200.0

Note: The symbol "< " denotes a non-detect at the numerical level listed.

Table 15, CRCD Sediment Evaluation Report

Willamette River – High PAHs – ug/kg (ppb)

Site	Date	RM	Fluor anthrene	Pyrene	Benzo anthracene	Chryse ne	Benzo(b,k) fluoranthene	Benzo(a) pyrene	Ideno(1,2,3-cd) pyrene	Dibenz(a,h) anthracene	Benzo(g,h,i) perylene	Total High PAHs
WR-BC-01	24-Jul-97	0.10	10	9	4	5	14	9	8	3	9	71
WR-A	24-Jul-97	0.10	4	5	3	3	13	11	12	3	12	66
WR-GC-02A	24-Jul-97	0.10	71	96	44	52	122	103	76	13	77	654
WR-GC-02B	24-Jul-97	0.10	4	5	2	2	6	5	6	2	6	38
WR-BC-03	24-Jul-97	0.40	7	8	4	5	15	9	11	5	12	76
WR-GC-04A	24-Jul-97	0.80	158	198	86	112	160	123	108	19	115	1,079
WR-GC-04B	24-Jul-97	0.80	83	101	32	43	44	40	36	6	39	424
WR-GC-05A	24-Jul-97	0.80	10	12	3	5	7	4	5	1	5	52
WR-GC-05B	24-Jul-97	0.80	1	2	1	1	3	1	2	1	2	14
WR-GC-06A	24-Jul-97	0.95	3	5	2	2	4	2	3	1	3	25
WR-GC-06B	24-Jul-97	0.95	1	1	<5.0	1	<5.0	1	1	1	1	6
WR-BC-07	24-Jul-97	1.60	73	67	42	49	163	109	97	22	91	713
WR-BC-08	24-Jul-97	1.70	23	26	14	17	50	36	33	8	33	240
WR-BC-09	24-Jul-97	2.05	83	111	58	67	212	176	143	26	142	1,018
WR-BC-10	24-Jul-97	2.45	208	265	158	180	539	459	383	66	385	2,643
WR-B	24-Jul-97	2.45	150	172	90	105	324	251	211	39	210	1,552
WR-GC-11A	24-Jul-97	2.90	673	789	373	452	1,061	530	802	142	832	5,654
WR-BC-12, 13, 14	24-Jul-97	3.40	131	178	69	93	228	192	158	23	159	1,231
WR-BC-15	24-Jul-97	3.80	1,100	1,300	709	778	1,962	1,100	880	207	860	8,896
WR-BC-16,17	24-Jul-97	4.10	1,300	1,600	740	930	1,100	990	660	173	660	8,153
WR-GC-18A	22-Jul-97	5.10	217	215	74	90	121	81	55	11	56	920
WR-GC-19A	22-Jul-97	5.10	1	1	<5.0	<5.0	<5.0	1	<5.0	<5.0	1	3
WR-BC-20	24-Jul-97	5.15	14,000	15,000	4,200	5,400	6,600	6,200	4,500	690	4,500	61,090
WR-BC-21	24-Jul-97	5.90	2,000	2,200	97	109	113	103	74	10	78	4,784
WR-BC-22	24-Jul-97	6.20	250,000	260,000	67,000	86,000	103,000	99,000	74,000	9,100	76,000	1,024,100
WR-BC-23	24-Jul-97	6.50	1	1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	1	2
WR-GC-24A	22-Jul-97	6.70	480	669	166	210	259	218	179	21	190	2,392
WR-GC-24B	22-Jul-97	6.70	<5.0.0	<5.0.0	<5.0.0	<5.0.0	<5.0.0	1	1	<5.0.0	1	2
WR-GC-25A	24-Jul-97	6.70	324	313	92	105	133	162	125	22	131	1,407
WR-BC-26, 27, 28	24-Jul-97	6.90	6	6	<5.0.0	3	6	3	2	1	3	30
WR-BC-29	24-Jul-97	7.50	73	73	44	49	63	41	25	7	23	398
WR-C	24-Jul-97	7.50	62	56	28	35	55	37	28	5	27	333
WR-GC-30A	22-Jul-97	8.50	96	87	46	53	68	43	35	8	34	470
WR-GC-31A	22-Jul-97	8.90	57	53	21	28	34	22	17	4	17	253
WR-GC-32A	22-Jul-97	10.00	1	1	<5.0	<5.0	<5.0	1	<5.0	<5.0	1	3
WR-GC-33A	22-Jul-97	10.10	69	81	28	42	40	25	18	5	21	329
WR-GC-34A	23-Jul-97	10.00	217	237	157	137	196	170	96	17	87	1,314
WR-GC-35A	23-Jul-97	10.10	110	104	49	54	72	42	30	7	29	497
WR-BC-36	24-Jul-97	10.30	93	93	33	40	49	33	27	7	30	405
WR-GC-37A	23-Jul-97	11.10	2	2	1	1	<5.0	1	<5.0	<5.0	1	6
WR-GC-38A	23-Jul-97	11.20	124	136	37	38	63	62	49	4	59	572
WR-GC-39A	23-Jul-97	11.65	41	48	15	16	20	20	14	3	16	193
WR-CD-40A	23-Jul-97	11.30	2	1	1	1	<5.0	1	<5.0	<5.0	1	6
WR-CD-41A	23-Jul-97	11.35	40	40	15	15	17	15	10	2	9	163
WR-CD-41B	23-Jul-97	11.35	193	160	44	45	56	44	37	6	44	629
WR-CD-42A	23-Jul-97	11.50	51	50	13	21	25	14	12	2	14	202
WR-CD-42B	23-Jul-97	11.50	61	62	23	29	35	23	17	5	18	273
WR-CD-42C	23-Jul-97	11.50	112	114	45	51	66	42	29	7	31	497
WR-CD-42D	23-Jul-97	11.50	101	93	35	39	50	34	23	5	26	406
WR-CD-43A	23-Jul-97	11.55	172	149	50	62	62	29	22	5	21	572
WR-D	23-Jul-97	11.55	310	450	135	149	183	168	116	15	121	1,647
WR-CD-43B	23-Jul-97	11.55	25	38	15	19	25	19	16	2	17	176
Average Value			5,253	5,490	1,440	1,841	2,258	2,131	1,600	206	1,640	21,859
Maximum Value			250,000	260,000	67,000	86,000	103,000	99,000	74,000	9,100	76,000	1,024,100
Screening Levels			1,700	2,600	1,300	1,400	3,200	1,600	600	230	670	12,000

Note: The symbol "< " denotes a non-detect at the numerical level listed.

Willamette River P450 RGS (Dioxin/Furan Screen)

Site	Date	RM	6 Hour B(a)P Eq (ug/g)	6 Hour TEQ (ng/g)	16 Hour B(a)P Eq (ug/g)	16 Hour TEQ (ng/g)	Ratio	Primary* Contaminates
WR-BC-01	24-Jul-97	0.10	5.7	0.3	1.4	0.1	4	both
WR-A	24-Jul-97	0.10	7.3	0.4	2.3	0.1	3	both
WR-GC-02A	24-Jul-97	0.10	8.7	0.5	5.9	0.4	1	both
WR-GC-02B	24-Jul-97	0.10	7.0	0.4	2.1	0.1	3	both
WR-BC-03	24-Jul-97	0.40	162.9	9.8	20.0	1.2	8	PAHs
WR-GC-04A	24-Jul-97	0.80	250.3	15.0	60.0	3.6	4	both
WR-GC-04B	24-Jul-97	0.80	205.2	12.3	27.3	1.6	8	PAHs
WR-GC-05A	24-Jul-97	0.80	49.7	3.0	8.6	0.5	6	PAHs
WR-GC-05B	24-Jul-97	0.80	44.0	2.6	5.6	0.3	8	PAHs
WR-GC-06A	24-Jul-97	0.95	65.6	3.9	5.3	0.3	12	PAHs
WR-GC-06B	24-Jul-97	0.95	9.6	0.6	3.3	0.2	3	both
WR-BC-07	24-Jul-97	1.60	185.9	11.2	31.1	1.9	6	PAHs
WR-BC-08	24-Jul-97	1.70	192.8	11.6	22.7	1.4	9	PAHs
WR-BC-09	24-Jul-97	2.05	166.2	10.0	28.5	1.7	6	PAHs
WR-BC-10	24-Jul-97	2.45	403.4	24.2	109.3	6.6	4	both
WR-B	24-Jul-97	2.45	192.1	11.5	101.3	6.1	2	both
WR-GC-11A	24-Jul-97	2.90	827.7	49.7	146.1	8.8	6	PAHs
WR-BC-12,13,14	24-Jul-97	3.40	198.4	11.9	37.3	2.2	5	both
WR-BC-15	24-Jul-97	3.80	155.6	9.3	41.3	2.5	4	both
WR-BC-16,17	24-Jul-97	4.10	428.4	25.7	42.6	2.6	10	PAHs
WR-GC-18A**	22-Jul-97	5.10	3.9	0.2	7.7	0.5	0.5	PCBs/Dioxins
WR-GC-19A	22-Jul-97	5.10	1.3	0.1	0.2	0.0	6	PAHs
WR-BC-20	24-Jul-97	5.15	1096.0	65.8	321.6	19.3	3	both
WR-BC-21	24-Jul-97	5.90	482.0	28.9	218.5	13.1	2	both
WR-BC-22**	24-Jul-97	6.20	814.5	48.9	1196.7	71.8	0.7	PCBs/Dioxins
WR-BC-23	24-Jul-97	6.50	8.3	0.5	0.9	0.1	9	PAHs
WR-GC-24A**	22-Jul-97	6.70	2.0	0.1	7.5	0.4	0.3	PCBs/Dioxins
WR-GC-24B	22-Jul-97	6.70	1.2	0.1	0.2	0.0	7	PAHs
WR-GC-25A	24-Jul-97	6.70	196.0	11.8	42.1	2.5	5	both
WR-BC-26,27,28	24-Jul-97	6.90	85.4	5.1	11.1	0.7	8	PAHs
WR-BC-29	24-Jul-97	7.50	326.8	19.6	64.4	3.9	5	both
WR-C	24-Jul-97	7.50	2.4	40.0	23.8	397.1	10	PAHs
WR-GC-30A**	22-Jul-97	8.50	3.0	0.2	4.7	0.3	0.6	PCBs/Dioxins
WR-GC-31A	22-Jul-97	8.90	6.4	0.4	6.7	0.4	1	both
WR-GC-32A**	22-Jul-97	10.00	3.8	0.2	6.6	0.4	0.6	PCBs/Dioxins
WR-GC-33A**	22-Jul-97	10.10	2.8	0.2	6.7	0.4	0.4	PCBs/Dioxins
WR-GC-34A	23-Jul-97	10.00	125.0	7.5	19.6	1.2	6	PAHs
WR-GC-35A	23-Jul-97	10.10	125.4	7.5	60.5	3.6	2	both
WR-BC-36	24-Jul-97	10.30	401.6	24.1	39.0	2.3	10	PAHs
WR-GC-37A	23-Jul-97	11.10	72.9	4.4	14.5	0.9	5	both
WR-GC-38A**	23-Jul-97	11.20	6.9	0.4	13.4	0.8	0.5	PCBs/Dioxins
WR-GC-39A	23-Jul-97	11.65	9.5	0.6	4.8	0.3	2	both
WR-CD-40A	23-Jul-97	11.30	9.2	0.6	8.5	0.5	1	both
WR-CD-41A	23-Jul-97	11.35	85.0	5.1	25.6	1.5	3	both
WR-CD-41B	23-Jul-97	11.35	144.7	8.7	150.9	9.1	1	both
WR-CD-42A	23-Jul-97	11.50	97.1	5.8	30.0	1.8	3	both
WR-CD-42B	23-Jul-97	11.50	116.3	7.0	30.1	1.8	4	both
WR-CD-42C	23-Jul-97	11.50	65.4	3.9	20.5	1.2	3	both
WR-CD-42D	23-Jul-97	11.50	121.0	7.3	29.4	1.8	4	both
WR-CD-43A	23-Jul-97	11.55	149.5	9.0	156.8	9.4	1	both
WR-D	23-Jul-97	11.55	141.9	8.5	46.0	2.8	3	both
WR-CD-43B	23-Jul-97	11.55	95.4	5.7	13.0	0.8	7	PAHs

Note: The term "both" indicates that PAHs and Chlorinated Compounds have been detected; if the corresponding sample analysis show PAHs & PCBs present in significant amounts, it is not likely that Dioxins are present in that sample.

*Based on ratio of 6hr/16 hr where ratio > 5 = PAHs; ratio 5 to 1 = both PAHs and chlorinated compounds; and ratio < 1 = chlorinated compounds.
ug B(a)P Eq = PAHs detected by P450 RGS.

TEQ = Chlorinated hydrocarbons detected by P450 RGS.
** See text page 8 - P-450.

Table 17, CRCD Willamette River (12 Deep Water Sites). Sampled September 14, 1998

Inorganic Metals, TOC and Organotin (TBT)

Sample I.D.	Sb	As	Cd	Cr	Cu	Pb	Hg	Ni	Ag	Zn	TOC	TBT
	mg/kg (ppm)										%	ug/L (ppb)
Grab 1	<0.02	1.8	0.27	19.5	26.2	17.7	0.07	15.8	0.2	70.1	1.98	0.05
Grab 2	0.02	1.8	0.22	17.7	22.7	13.9	0.05	16.1	0.2	66	1.38	0.05
Grab 3	<0.02	1.8	0.16	14.3	18.3	9.58	0.03	15.2	0.16	52.3	1.03	<0.02
Grab 4	0.02	1.8	0.2	21.2	26.2	17.7	0.07	16.3	0.24	67.9	2.27	<0.02
Grab 5	<0.02	1.3	0.11	9.3	13.1	5.6	0.02	12.7	0.12	40	0.81	<0.02
Grab 6	<0.02	0.7	<0.09	9.9	12.3	4.64	<0.02	12.6	0.08	38.6	0.65	0.02
Grab 7	<0.02	1.3	0.21	18.3	25.5	12.7	0.05	16.2	0.18	58.3	2.06	0.07
Grab 8	0.02	1.4	0.21	21.4	48	15.2	0.07	18.3	0.3	73.9	1.41	0.12
Grab 9	<0.15	2.4	0.14	20.1	<21.6	14.5	0.06	16.8	0.22	63.7	1.58	<0.02
Grab 10	<0.15	2	0.17	20.1	<22	14.8	0.06	17.1	0.23	63.2	1.57	<0.02
Grab 11	<0.16	2.3	0.19	22.3	<25.6	13.2	0.07	18	0.29	64.1	2.24	<0.02
Grab 12	<0.22	2.1	0.15	18.3	<20.5	13.6	0.05	16.8	0.22	63.2	1.23	<0.02
Screening level (SL)	150	57	5.1	*	390	450	0.41	140	6.1	410		0.15
Mean	0.005	1.7	0.17	17.7	16	12.8	0.05	16	0.2	60.1		0.026
Maximum	0.02	2.3	0.27	22.3	48	17.7	0.07	18.3	0.3	73.9		0.12

*SL not established

(<) = Non-detect (ND) at method detection limit.

Table 18, CRCD Willamette River (12 Deep Water Sites) Sampled September 14, 1998

Pesticides/PCBs

Sample I.D.					
	4,4'-DDD	4,4'-DDE	4,4'-DDT	Total DDT	Total PCBs
Grab 1	<3.3	3.5	<6.7*	3.5*	13
Grab 2	<3.3	2.5	**13**	**15.9**	<10
Grab 3	<3.3	<2.3	<6.7*	<6.7	<10
Grab 4	**11**	5.9	**49**	**65.9**	13
Grab 5	**14**	<2.3	**11**	**25**	<10
Grab 6	<3.3	<2.3	<6.7*	<6.7*	<10
Grab 7	<3.3	<3.8	<6.7*	3.8*	<10
Grab 8	<3.3	2.4	<6.7*	2.4*	<10
Grab 9	<2	<2	<2	<2	<10
Grab 10	<2	<2	<2	<2	14
Grab 11	<2	3	<2	3	<10
Grab 12	<2	<2	<2	<2	14
Screening level (SL)				6.9	130

*Reporting limit exceeded screening level, value unreliable

(<) = Non-detect (ND) at method detection limit.

Table 19, CRCD Willamette River (12 Deep Water Sites) Sampled September 14, 1998

Phenols, Phthalates and Misc. Extractables

Sample I.D.	Phenols	Phthalates			Misc. Extractables		
		Di-n-octyl	Butylbenzyl	bis(2-Ethylhexyl)	Benzyl Alchol	Benzoic Acid	Dibenzofuran
	ug/kg (ppb)						
Grab 1	<20	<20	21	400	12	<100	<20
Grab 2	<20	<20	25	280	<6	<6	<20
Grab 3	<20	<20	26	200	<6	<6	<20
Grab 4	<20	<20	55	470	15	100	45
Grab 5	<3000*	<10000*	<10000*	<10000*	<50000*	<500	<10000*
Grab 6	<30	<100	<100	<100	<30	<100	<100
Grab 7	<20	<20	<100	300	6	<100	<20
Grab 8	<20	25	<20	430	9	<100	<20
Grab 9	<20	<20	38	410	<6	<100	<20
Grab 10	<20	<20	48	320	8	<100	<20
Grab 11	<20	<20	22	440	<6	<100	<20
Grab 12	<20	<20	33	1000	9	<100	<20
Screening level (SL	670	5100	970	8300	57	650	540
Mean	<20	2	22	388	5	8	4
Maximum	<30	25	55	1000	15	100	45
* Reporting limit exceeds the screening level, value unknown.							

(<) = Non-detect (ND) at method detection limit.

Table 20, CRCD Willamette River (12 Deep Water Sites) Sampled September 14, 1998

Polynuclear Aromatic Hydrocarbons (PAHs)

Low Molecular Weight Analytes

Sample I.D.	Acenapththene	Acenaphthylene	Anthracene	Fluorene	2-Methylnapthalene	Naphthalene	Phenanthrene	Total Low PAHs
	ug/kg (ppb)							
Grab 1	<20	<20	32	<20	<20	130	162	324
Grab 2	26	21	33	<20	<20	100	180	360
Grab 3	<20	<20	25	20	<20	88	133	266
Grab 4	250	90	310	180	160	1200	2190	2190
Grab 5	**31000**	<10000*	**26000**	**14000**	<10000*	**84000**	**155000**	**310000**
Grab 6	160	<100	340	140	<100	1300	1940	3880
Grab 7	<20	<20	<20	<20	<20	23	23	46
Grab 8	<20	<20	<20	<20	<20	33	33	66
Grab 9	<20	<20	<20	<20	<20	26	26	52
Grab 10	<20	<20	<20	<20	<20	20	20	40
Grab 11	<20	<20	<20	<20	<20	48	48	96
Grab 12	<20	<20	<20	<20	<20	25	25	50
Screening level	500	560	960	540	670	2100	1500	5200
Mean	2620	9	2228	1195	13	7249	13315	
Maximum	31000	90	26000	14000	160	84000	155000	

* Reporting limit exceeds the screening level, value unknown.

(<) = Non-detect at method detection limit.

Table 21, CRCD Willamette River (12 Deep Water Sites) Sampled September 14, 1998

Polynuclear Aromatic Hydrocarbons (PAHs)

High Molecular Weight Analytes

Sample I.D.	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Indeno(1,2,3-cd)pyrene	Pyrene	Total High PAHs
Grab 1	180	230	210	150	150	190	51	350	220	330	2061
Grab 2	210	290	220	160	150	210	40	380	220	430	2310
Grab 3	81	110	89	69	72	94	<20	200	100	250	1065
Grab 4	1200	1500	1100	920	620	1200	140	**2600**	**980**	**3000**	**13260**
Grab 5	**39000**	**39000**	**19000**	**21000**	**18000**	**42000**	<10000*	**110000**	**24000**	**140000**	**452000**
Grab 6	340	340	180	190	170	360	<100	1200	230	1400	4410
Grab 7	20	22	23	<20	<20	26	<20	59	<20	62	212
Grab 8	28	29	34	26	<20	36	<20	85	23	83	344
Grab 9	26	28	29	21	<20	31	<20	67	23	68	293
Grab 10	27	36	32	24	22	32	<20	59	29	62	323
Grab 11	28	22	24	<20	<20	27	<20	85	<20	75	261
Grab 12	25	28	27	20	<20	31	<20	65	23	72	291
Screening level	1300	1600	3200		670	1400	230	1700	600	2600	12000

* Reported limit exceeds the screening level, value unknown.

(<) = Non-detect at method detection limit.

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